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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. LV 1960

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EDITED BY
JOHN F. HANSON

PUBLICATION COMMITTEE
JOHN F. HANSON
GEORGE S. TULLOCH JAMES A. SLATER

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JOHN F. HANSON
GEORGE S. TULLOCH JAMES A. SLATER

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THE GENUS PELLUCIDOMYIA MACFIE (DIPTERA, CERATOPOGONIDAE)

By Willis W. Wirth[1]

Macfie in 1939 described the new genus and species, *Pellucidomyia ugandae,* from two females taken in the highlands of southern Uganda. In 1946 Lane proposed the genus *Macfiehelea* for *oliveirai* Lane, known from a single female from Brazil. In 1956 Lane added two more species from Panama to *Macfiehelea.* In 1956 I collected two female specimens in Queensland, Australia, which agree generically with *Pellucidomyia* and *Macfiehelea,* genera which I am forced to consider synonymous. The purpose of this paper is to point out the salient characters of the genus, to give a key to the known species, and to describe the new species from Australia.

Genus *Pellucidomyia* Macfie

Pellucidomyia Macfie, 1939, Ruwenzori Exped., 1934–5, vol. 1, no. 5, Ceratopogonidae, p. 99. (Type: *Pellucidomyia ugandae* Macfie, monobasic.)

Macfiehelea Lane, 1946, Rev. de Ent. 17: 208 (Type: *Macfiehelea oliveirai* Lane, monobasic); Lane, 1956, Rev. Brasil. Biol. 16: 435 (key to 3 Neotropical spp.). NEW SYNONYMY.

Diagnosis.—Body densely white or blackish pollinose above. Head flattened anteroposteriorly, the unflattened portion with same pollinosity as scutum; eyes broadly separated; antennae moderately long, with sparse basal verticils; palpus 5-segmented, third segment slender, without pit. Scutum conically produced anteriorly, without anterior spine or tubercle. Legs slender, femora unarmed, slightly club-shaped distally; fore legs short, mid legs moderately

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[1] Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture.

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long, hind legs very long; fourth tarsomere cordiform to transverse on fore and mid legs, long and cylindrical on hind leg; fifth tarsomere unarmed, swollen on fore leg, not on mid and hind legs; claws equal and simple on fore and mid legs, a single very long claw on hind leg. Wing venation similar to that of *Bezzia;* one radial cell; costa extending to 0.8 of wing length; microtrichia absent or very small, wing appearing milky or blue iridescent; macrotrichia absent. Abdomen of female without gland rods; with a pair of tufts of long hairs ventrally on eighth segment; two spermathecae; abdomen more or less curled ventrally under body. Male unknown.

The genus *Pellucidomyia* is closely related to the genera *Clinohelea* Kieffer, *Metahelea* Edwards, *Tetrabezzia* Kieffer, *Ceratobezzia* Kieffer, *Heteromyia* Say and *Neurohelea* Kieffer. These genera all have the fifth tarsomere unarmed, the eighth abdominal segment of the female abdomen with a pair of ventral tufts of long hairs, gland rods absent and the claws unequal, at least on the hind legs.

Pellucidomyia leei Wirth, n. sp.

Female.—Length about 2.5 mm., wing 2.0 mm.

Body very dark brown, almost black; flattened vertex of head, broad median portion of scutum to breadth of scutellum, scutellum and all of abdominal dorsum, densely pearly white pollinose. Antenna black except major portion of enlarged second segment dorsally yellowish. Palpus black. Legs mostly pale yellow, the following dark brown: coxae, trochanters, distal half of fore femur and narrow apices of fore tibia, four proximal tarsomeres and all of fifth tarsomere of fore tarsus; proximal third and distal fourth of mid femur, narrow apices of mid tibia, first and second tarsomeres and all of third and fourth tarsomeres of mid tarsus; proximal fourth and distal third of hind femur, narrow apices of hind tibia and first tarsomere, and all of distal tarsomeres of hind leg, the distal bands on hind femur and tibia much more intense, appearing blackish. Abdomen slender, curving down posteriorly, the segments convex dorsally; each tergum with a pair of small blackish sensory pits; first tergum with anterior portion slightly elevated and bearing long fine pale hairs, the posterior portion less densely pollinose and appearing blackish in some lights; last segment blackish, cerci yellowish. Scutum without apparent vestiture, slightly elevated in mid-line at mid-length, subconically produced anteriorly on anterior margin; surface appearing obliquely rugulose, the rugulae directed posteriorly toward mid-line where the pollinosity is not quite so dense. Other characters as in generic diagnosis.

Male.—Unknown.

Types.—Holotoype female, Hartley's Creek, north of Cairns, Queensland, 24 April 1957, W. W. Wirth (type no. 64756, U.S.N.M.). Paratype, 1 female, same data as type, deposited in collection of the School of Public Health and Tropical Medicine, University of Sydney, Australia. These specimens were swept from vegetation bordering a small stream near the coast in rather open gum forest.

I take great pleasure in naming this species in honor of David J. Lee, of the School of Public Health and Tropical Medicine of the University of Sydney, a distinguished authority on Australian Ceratopogonidae, with whom I had the privilege of working in 1956–57 at Sydney on a Fulbright Research Scholarship.

Key to the Species of Pellucidomyia

1. Femora entirely blackish or dark brown; body whitish pollinose from head to tip of abdomen 2
   Femora with broad yellowish bands, tibae yellow 4
2. Mid and hind tibiae blackish with only a narrow basal pale band (Brazil) .... *oliveirai* (Lane)
   Tibial markings otherwise 3
3. Mid tibia blackish with narrow subbasal brown band; hind tibia yellowish with an apical blackish band (Panama) .... *wirthi* (Lane)
   Mid tibia yellowish on proximal half, blackish distally; hind tibia yellowish with broad subbasal and apical brown bands (Panama) .... *blantoni* (Lane)
4. Body whitish pollinose from vertex to tip of abdomen; mid and hind femora narrowly dark at bases and apices (Queensland) .... *leei,* n. sp.
   Body dull black dorsally, legs yellow except narrow dark band at apex of hind femur and at apex of hind tibia (Uganda) .... *ugandae* Macfie

The occurrence of five such closely related species, structurally similar but easily recognizable on characters of coloration, on each of the three large continents of the Southern Hemisphere where tropical conditions exist, but not in the more thoroughly collected Northern Hemisphere, is remarkable and suggests speculations on their geographical origin and distribution . Not much more can be said, however, until the tropical parts of Asia are more thoroughly collected in order to ascertain whether *Pellucidomyia* is a Pantropical genus or of more restricted distribution.

THE GENUS KEONOLLA (HOMOPTERA, CICADELLIDAE)

By Dwight M. DeLong and Neva L. Currie[1]

The genus *Keonolla* was erected by Oman in 1949[2] and *Proconia confluens* Uhler was designated as the genotype.

The major characteristics of the genus are: Resembling *Neokolla* Melichar and previously placed in that genus. The male genital structures show relationship to *Graphocephala* Van Duzee. Head wider than pronotum, anterior margin rounded to front. Crown broad and tending to be flat, median length greater than length next the eye. Forewing with a small appendix, inner anteapical cell short, central anteapical cell parallel-sided, first apical cell long and membraneous. Male plates elongate, triangular, connective Y-shaped, junction with aedeagus terminal. Aedeagus asymmetrical, with a pair of elongate acuminate processes extending dorsad from base. Aedeagus shaft short, small, lying dorsad of base of aedeagus.

Four species and one subspecies have been placed in the nearctic fauna. Three of these are southern or southwestern and one is northwestern in distribution. Six other species and one subspecies which have been collected in Mexico and the southwestern United States and which show relationship to the known species are being described at this time.

All types are in the DeLong collection unless otherwise designated.

Keonolla confluens (Uhler)

Proconia confluens Uhler, Proc. Acad. Nat. Sci. Phila., P. 285, 1861.

A blunt headed species with a rather broad crown, variable in intensity of color markings and variable in the male genital structures. Length 6.5–7 mm.

Crown broad, blunt, about one-third wider between eyes at base than median length.

Color varying from pale gray or brownish to black, and markings varying in intensity. In normally well marked specimens the crown is pale with a spot at apex posterior to which is a pair of proximal longitudinal marks and from which a series of reflexed arcs extends laterally on each side of median line. On the basal half a pair of proximal, elongate, circular rings extends through the ocelli. An elongate, longitudinal mark is next the eye on each side. Pronotum mottled with pale brown. Scutellum black with three prominent pale markings, an apical median dash and a pair of separated, elongate basal spots. Forewings tinted with pale brown, veins dark. Some specimens at hand are almost entirely dark brown or black with few pale areas. Certain others have dark forewings with a broad pale stripe along the claval vein as in *dolobrata*.

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[1] Department of Zoology and Entomology, The Ohio State University.

[2] Wash. Ent. Soc. Mem. No. 3, p. 74.

Genitalia: Female seventh sternite roundedly produced forming a blunt apex. Male genital structures variable. In typical specimens the plates are elongate and tapered to blunt apices. The styles are rather long with blunt apices. In lateral view the apical portion of the aedeagus bears two erect processes which are about equal in length, bent forward on the apical half and broadened just before a constricted and pointed apex.

This is a common species in the northwestern United States on shrubs and herbaceous plants. It commonly occurs upon certain species of willow.

Due to variability in color and genital structures this species appears to have a great variety of mutants and is difficult to identify. A considerable amount of biological work will probably be required to establish species limitations in this variable complex.

Keonolla confluens **surcula**, n. subsp.

Resembling *confluens* in form and appearance but with different genital structures. Length 6–7 mm.

Crown appearing more angularly produced than in *confluens*, about one-fourth wider between eyes at base than median length.

Color: Crown usually well marked. The pale spot at apex surrounded by a black band which extends above the margin on each side almost to eye. This band is curved basally and surrounds the reflexed arcs. Between the ocelli on the disk is a pair of proximal elongate "horseshoe" shaped bands with the open end basally. A pair of elongate black spots extends the length of the eyes between the eyes and ocelli. The anterior portion of the pronotum is mottled with dark brown and black. Scutellum black with an elongate pale spot on the apical half and a pair of elongate pale lateral spots. Wings brown with white mottling.

Genitalia: Female seventh sternite with posterior margin produced, the central half appearing as a produced lobe. Male plates long, triangular, with pointed apices. Style narrowed to inner margin at two-thirds its length to form a pointed apex which is curved outwardly. Aedeagus with an erect basal process and two long erect processes on the apical half. The anterior process is decidedly shorter than the apical process.

Holotype male, paratype male and allotype female collected at Twin Falls, Idaho, July 22, 1938, from willow by Dr. Richard Hofmaster.

Keonolla confluens subsp. *pacifica* (DeLong & Severin)

Neokolla confluens var. *pacifica* (DeLong & Severin), Hilgardia 19: 177–8, 1949.

Resembling *confluens* in size and general appearance but the male genitalia are different. Length 6.5–7 mm.

The crown is bluntly produced as in *confluens.*

Color: The crown and scutellum are vividly marked with black by an interrupted, rather broad transverse band just above the margin of apex, and an open "horseshoe" marking either side of middle at the base. This is a modification of the *confluens* color pattern.

Genitalia: The posterior margin of the female seventh sternite is produced to form a broad, median produced apex. The male plates are elongate, triangular, with narrow produced apices. The styles are gradually narrowed to a narrow apex which is truncate with a projecting tooth on the outer apical margin. The aedeagus has a short dorsal process at the base and has two long dorsally directed processes, one at the apex of the ventral portion and the other, which is a little shorter, arises at about the middle of the ventral portion. These are quite slender in comparison to the similar aedeagal processes of *confluens* and are convexly curved on the caudal margin just before the narrow, acutely pointed tips.

A series of California specimens which are very similar in markings and genital structures has indicated that this may be a subspecies or even a specific form closely related to *confluens.*

It has been collected in good numbers on *Adenostoma* in Los Angeles County, California.

Keonolla lugubris (Signoret)

Tettigonia lugubris Signoret, Ann. Soc. Ent. France (3) 2:13, 1854.

Resembling *confluens* in form and appearance and closely related to it. Length 6–6.5 mm.

Crown broad and bluntly angled, less than twice as wide between eyes at base as median length.

Color varying from pale with brownish markings to almost black.

In many specimens the coloration is similar to the color pattern of *confluens.* The reflexed arcs just above the margin of the crown and the dark circular rings either side of middle on the basal half resemble the same markings in *confluens.* An additional marking is a curved line extending from the ocellus, each side, basally then toward the eye and forward to the anterior margin of the eye. The pronotum is pale, mottled with brown. The scutellum is dark with the median area pale. The forewing is usually marked with darker veins except the claval suture which is light.

Genitalia: The posterior margin of the female seventh sternite is rather broadly, roundedly produced. The male plates are long and tapered to rather blunt, rounded apices. The styles appear broad and rather abruptly narrowed near the apex to a pointed tip. The ventral portion of the aedeagus is broad in lateral view with two dorsal erect processes arising near the apex. The posterior process is a little longer than the preceding process; both are rather broad with a constriction near the apex, producing narrow pointed tips.

This is a common species in Mexico. Specimens are at hand from Mexico City D. F., Chapingo D. F. and Chiapis. It also is reported for the states of the southwest which border Mexico.

Keonolla uhleri (Ball)

Tettigonia hieroglyphica var. *uhleri* Ball, Proc. Iowa Acad. Sci. 8: 18, 1901.
Cicadella hieroglyphica var. *inscripta* Olsen, Ann. Ent. Soc. Amer. 15: 360, 1922.
Cicadella hieroglyphica subsp. *lutzi* Olsen, Ann. Ent. Soc. Amer. 15: 360, 1922.
Cicadella hieroglyphica subsp. *barberi* Olsen, Ann. Ent. Soc. Amer. 15: 361, 1922.

Resembling *confluens* in form, general appearance and coloration. The male genital structures will separate this from related species. Length 6–6.5 mm.

Crown rather broad and bluntly angled, almost two-thirds as long as basal width between the eyes.

Color variable, grayish green or reddish brown with a color pattern similar to *confluens.* The reflexed arcs on the anterior margin of the crown are conspicuous either side of median apical pale area. The basal portion of the crown is pale with a pair of approximate median lines, and a heavier pair extending through the ocelli, converging anteriorly. The pale area between the ocelli and the eye, either side, contains dark markings. The pronotum is pale with darker mottling. The scutellum is dark with several pale spots. The forewings are mottled, veins usually darker.

Genitalia: The posterior margin of the female seventh sternite is produced on the posterior margin and rounded at apex. The male plates are elongate, tapered and with bluntly angled apices. The styles are narrowed on the apical third to pointed apices. The aedeagus has two long erect processes extending dorsally from the ventral portion. The posterior of these processes is rather uniform in width on the apical half before being narrowed to form a pointed tip. The anterior process is conspicuously broadened just before the rapidly narrowed apical portion.

This is a common species in the southwestern United States and in smaller numbers in the states just west of the Mississippi River.

Keonolla dolobrata (Ball)

Tettigonia hieroglyphica var. *dolobrata* Ball, Proc. Iowa Acad. Sci. 8: 18, 1901.

Typically black in color with a few pale markings and with genital structures similar to *confluens*. Length 6–6.5 mm.

Crown bluntly angled, about two-thirds as long at middle as basal width between the eyes.

Color: Usually shining black with a pale band just back of black spot on apex of crown, a median pale longitudinal band on base of crown, a broad median longitudinal band on base of scutellum and a pale band on claval suture of the forewing. In paler specimens the crown and pronotum are pale with dark markings and the forewings appear striate.

Genitalia: The posterior margin of the female seventh sternite is roundedly produced. The male plates are elongate, triangular and tapered to blunt apices. The styles are narrowed on the apical fourth to blunt apices. The aedeagus bears two erect processes which arise from the median ventral and apical ventral portion. Both are rather broad and are abruptly, concavely narrowed to a pointed tooth at apex. The posterior process is slightly longer.

This species apparently extends from the Mississippi River through the southwestern U. S. and into the foothills of the Rocky Mountains. It was previously misidentified for many years under the name *hieroglyphica*.

Keonolla minuenda, n. sp.

Resembling *dolobrata* in general form and appearance but smaller, with different color markings and with narrow aedeagal processes. Length 4.5–5.5 mm.

Crown rather blunt at apex, well produced, about three-fifths as long at middle as basal width between the eyes.

Color: Crown, pronotum and scutellum yellowish to greenish with dark markings. There is a large black spot at apex and a pair of longitudinal parallel bars behind the spot, on anterior portion. These bars are on the inner margins of the blackened areas containing the reflexed arcs from front. The median longitudinal portion of crown rather broadly pale. On the posterior portion a broad black mark expanded both anteriorly and posteriorly extends longitudinally just medially from each ocellus. A small black line extends from each ocellus toward the eye and expands at its apex before reaching the eye. There is a small black spot on the margin before each eye. Pronotum with dark markings on the anterior portion. Posterior portion darker green. Scutellum with a dark marking on each side so as to form a pale spot in each basal angle; a broad basal light area and a pale spot on apex. Forewings dark green with a pale claval suture, costal margin pale and claval area generally paler with dark claval veins.

Genitalia: Female seventh sternite rather strongly angularly produced to a blunt apex. Male plates long, narrow, tapered to acute apices. Aedeagal processes both pointed. The anterior process narrowed to inner margin, the posterior process narrowed to posterior margin.

Holotype male and allotype female collected at Huachuca Mts., Arizona, July 28, 1907. Male and female paratypes from Huachuca Mts., Arizona, July 20, 1937, from Santa Rita Mts., Arizona, June 8, 1937, and from Patagonia, Arizona, September 3, 1938, collected by D. J. and J. N. Knull.

Keonolla subrufa, n. sp.

Resembling *dolobrata* in general form but without dark color markings on crown and with distinct male genitalia. Length 6–6.5 mm.

Crown produced, blunt, about two-thirds as long at middle as basal width between the eyes.

Color: Rusty brown, crown with a black spot at apex. Ocelli black, a black line extending anteriorly from each ocellus to meet a curved line extending from front to disk. A small black dash just inside each ocellus. Pronotum with posterior portion darker. Scutellum with dark markings, forming several paler areas. Forewings dark brownish mottled with paler areas.

Genitalia: Female seventh sternite strongly produced on posterior margin. Male plates long, triangularly produced, tapered to acute tips. The pygofer bears a short spine at the caudal terminus of the dorsal margin. The two aedeagal processes are narrow and pointed at their apices; the posterior process is much longer than the anterior process.

Holotype male and paratype male collected at St. George, Utah, August 8, 1936, by E. W. Davis. Allotype female and male paratypes collected at Tucson, Arizona, September 29, 1929, by E. D. Ball. Male and female paratypes with typical markings are from Mexico City D. F., Mexico, September 13, 1939, D. M. DeLong, collector and from Cuernavaca, Morelos, Mexico, October 21, 1941. Others are from: Carapan, Michoacan, Mexico, October 2, 1941, Cordoba, Veracruz, Mexico, October 8, 1941, and Tres Cumbres, Morelos, Mexico, October 21, 1941, all collected by DeLong, Good, Caldwell and Plummer.

Keonolla subrufa **signara** n. subsp.

Resembling *subrufa* in structural characters but with distinct color markings. Length 6–6.5 mm.

Crown strongly produced, more than two-thirds as long at middle as basal width between the eyes.

Color: Crown reddish brown with a black spot at apex. A median pale stripe, bordered with black, extending from each side of apex to the black suture which extends forward from each ocellus. A median white stripe bordered by black extends forward from base two-thirds the length of the crown and terminates in a white cross band which extends between the two diagonal stripes. The pronotum and forewings are reddish brown mottled with small white spots. Scutellum black with pale markings.

Genital structures of both sexes similar to those of *subrufa*.

Holotype male, allotype female and male and female paratypes collected at Mazacian, Guerrero, Mexico, October 3, 1945, by DeLong, Balock and Hershberger. Paratypes from Mexico City, D. F. (Toluca Rd.), September 26, 1945, from Rio Tuxpan, Michoacan, Mexico, September 9, 1929, from Cuernavaca, Morelos, Mexico, September 25, 1945, all collected by DeLong, Plummer, Hershberger and Elliott, and also from Acapulca Rd., Mexico, November 22, 1938, collected by J. S. Caldwell.

This series of specimens is distinctly marked and is easily separated by color from the specimens of typical *subrufa*.

Keonolla torqua, n. sp.

Resembling *dolobrata* in general appearance but with a more produced head and with distinct genitalia. Length male 5.25 mm; female 5.75 mm.

Crown produced and bluntly angled, a little wider between eyes at base than median length.

Color: Crown pale with a black spot at apex. A circular black ring on each side extends across margin to front and encloses a paler area. A pair of slender black longitudinal lines touches the ocelli and extends to base. A pair of short longitudinal black bars on basal half between ocelli. A dark spot next inner margin of each eye. Pronotum pale with dark markings. A black area near lateral margin just back of each eye. Disk usually pale with irregular dark markings either side. Scutellum pale, basal angles black and a pair of dark parenthesis marks longitudinally connected by a transverse line at middle. Forewings tinted with reddish brown, claval vein paler, black pigment areas from apex of scutellum to disk forming an oblique marking. Females darker in color.

Genitalia: Female seventh sternite bluntly, angularly produced on posterior margin. Male plates long and very narrow on apical half. Styles short, slender, apex blunt. Aedeagus with the two caudal erect processes narrowed on apical third. The posterior process longer, the anterior process bent caudally on apical third.

Holotype male collected at Mexico City, D. F., Mexico, September 13, 1939 by D. M. DeLong. Allotype female and male and female papartypes collected at Laguna de Zempoala, Morelos, Mexico, October 21, 1945, by DeLong, Plummer, Hershberger and Elliott. Male and female paratypes from Rio Frio, D. F., Mexico, October 7, 1941, and Cuernavaca, Mor., Mexico, October 21, 1941, collected by DeLong, Caldwell, Good and Plummer and from Desierto de los Leones, D. F., Mexico, October 9, 1945, collected by DeLong, Elliott and Hershberger.

Keonolla curta, n. sp.

Resembling *dolobrata* in general form with different color markings and male genital structures. Length male 5.25 mm., female 6.5 mm.

Crown broad and bluntly produced, almost rounded, about three-fourths as long at middle as basal width between the eyes.

Color: Crown pale with dark markings. A black spot at apex and a black diagonal band extending from apex, half way to eye just above margin on either side. A pair of broad longitudinal dark bands extends from base through ocelli, converges and unites a little posterior to apex. A pair of slender, proximal longitudinal lines is between these on basal half. There is a pale brownish blotch next each eye. Pronotum with disk and posterior portion dark, anterior area pale with light brownish spots. Scutellum appearing black except for two proximal circular areas just back of margin of pronotum, each containing a black central spot. Forewings dark with pale mottling.

Genitalia: Female seventh sternite with posterior margin angularly produced. Male plates long and slender, styles narrowed on apical half to pointed tips. Aedeagus short with two short erect processes on caudal portion. The basal portion has a pair of rather long, narrow, erect processes between which is a median, broader erect portion expanded at the base and tapered to form a narrow elongation on the dorsal third, caudad of the anterior pair. The pygofers have long, narrow, dorsal spines which extend to two-thirds the length of the pygofers.

Holotype male collected at Rio Frio, D. F., Mexico, Km. 65, October 10, 1945, by DeLong, Hershberger and Elliott. Allotype female and paratype males and females collected as follows: Tuxpan, Michoacan, Km. 186, October 5, 1941, by DeLong, Plummer, Caldwell and Good; Tres Cumbres, Morelos, Mexico, October 21, 1941; Cuernavaca, Morelos, Mexico, October 21, 1941; Urapan, Michoacan, Mexico, October 1, 1941; Carapan, Michoacan, Mexico, October 2, 1941, all collected by DeLong, Good, Caldwell and Plummer; Zimipan, Hidalgo, Mexico, September 21, 1941 collected by Good, Caldwell and DeLong.

Keonolla gemmella, n. sp.

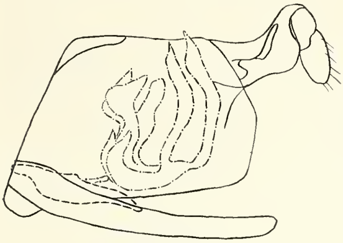
Resembling *curta* in form and general appearance but with different color markings and distinct male genitalia. Length male 5.5 mm. female 6 mm.

Crown angularly produced, one-third wider between eyes at base than median length.

Color: Crown yellow with a black spot at apex, a median spot just back of this and a pair of diagonal stripes extending halfway to eye on each side just above margin. These oblique stripes are connected to each ocellus by a narrow black line. A black, ovate, elongate ring occupies the basal three fifths of the crown on each side of middle. Pronotum with disk and basal portion green, the anterior and lateral margins yellowish, entire pronotum mottled with black. Scutellum yellow, basal angles black, a curved black line on each side extending from the base to apex. These are joined at each end and by a transverse black line across middle. Forewings green with dark veins, claval suture paler.

Genitalia: Female seventh sternite with posterior margin angu-

DELONG AND CURRIE PLATE I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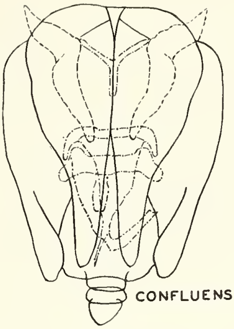
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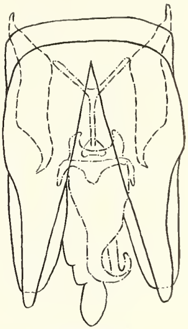
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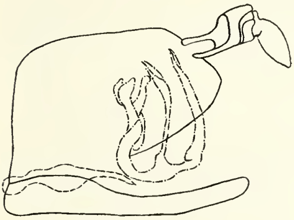
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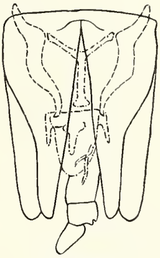
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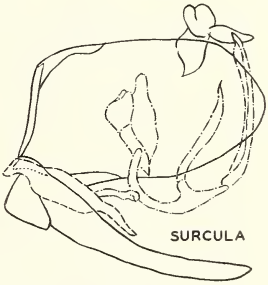
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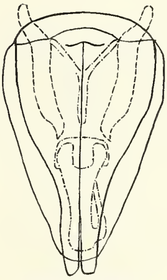
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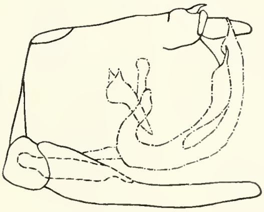
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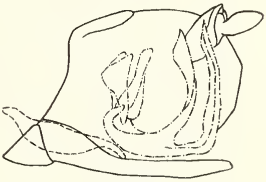
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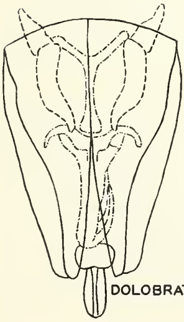
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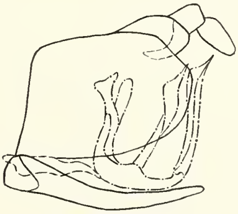
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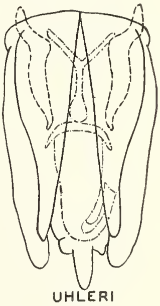
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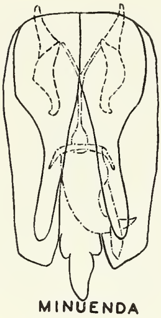
DeLong and Currie

Plate II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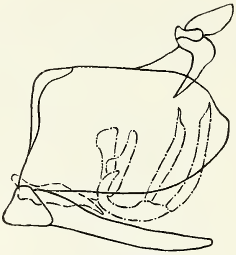
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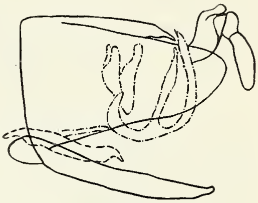
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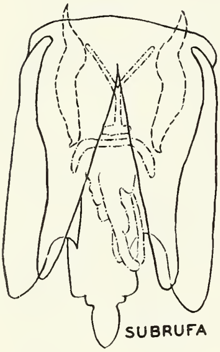
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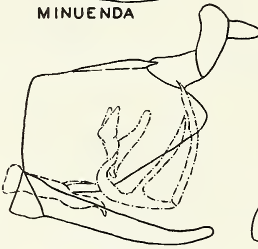
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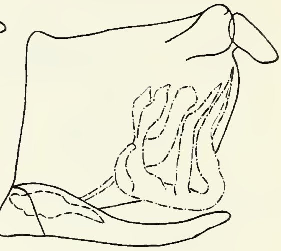
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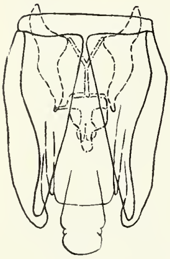
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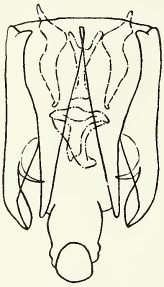
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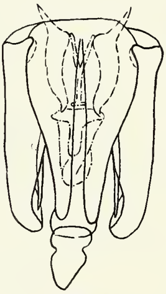
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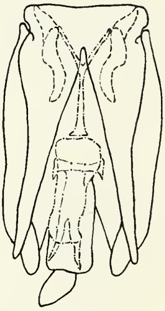
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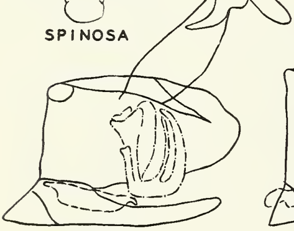
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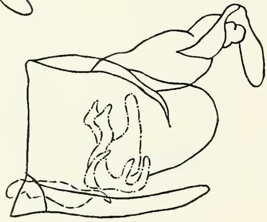
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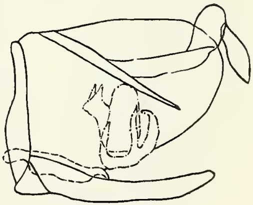
SPINOSA

larly produced. Male plates long, tapered to pointed apices. Styles curved inwardly with apices pointed outwardly. Aedeagus with two erect processes on the caudal portion. The posterior of these is heavier and the anterior is more narrowed. The basal portion bears an erect process which is broader and longer. There is a heavy spine on each side on the dorsal portion of the pygofer which extends almost to the posterior margin of the pygofer.

Holotype male and allotype female collected at Cuernavaca, Morelos, Mexico, K-57, October 21, 1941, by DeLong, Plummer, Good and Caldwell. Paratype male collected at Laguna de Zempoala, Morelos, Mexico, October 21, 1945, by DeLong, Plummer, Hershberger and Elliott.

Keonolla spinosa, n. sp.

Resembling *curta* in form and general appearance but with different genitalia. Length male 5.25, female 5.5 mm.

Crown produced and bluntly angled, a little wider between eyes at base than median length.

Color: Crown pale, mottled with pale brown. A black spot at apex. A pair of oblique lines extends from near apex above margin half way to eye on either side. A pair of dark spots anterior to middle between and proximal to the oblique lines. Pronotum paler on anterior and lateral margins, mottled with reddish brown. Scutellum marked as in *curta* with the two proximal spots just posterior to pronotum. Forewings brownish with darker brown areas.

Genitalia: Female seventh sternite with the posterior margin angularly produced. Male plates long, tapered to blunt apices. Styles narrowed from base to blunt tips. Aedeagus with a central portion and with three slender erect processes arising from the base. One is anterior, the other two are caudal and seem to arise together from the base. The anterior of these two is longer and straight, the posterior process is broader near the base and is curved anteriorly at the apex. The pygofer on each side bears a long dorsal spine which extends almost to the posterior margin of the pygofer.

Holotype male and paratype male collected at Rio Frio, D. F., Mexico, Km. 65, October 10, 1945, by DeLong, Hershberger and Elliott. Allotype female and male and female paratypes collected at Mexico City, D. F., Mexico, September 1, 1959, by D. M. DeLong. Paratype females from Zimipan, Hidalgo, Mexico, September 26, 1941, by DeLong, Good and Caldwell.

SOME MEXICAN AND COSTA RICAN MAYFLIES

By Jay R. Traver, Amherst, Mass.[1]

The first part of this series appeared in the October, 1958, issue of The Bulletin of the Brooklyn Entomological Society.

Campsurus cuspidatus Eaton

Campsurus cuspidatus Eaton, 1871, Trans. Ent. Soc. London 1871: 58, Pl. 3, fig. 12. Eaton, 1883, Revisional Monograph: 40, Pl. 5, fig. 8. Ulmer, 1942, Stett. Ent. Zeit. 103: 113–114, figs. 19 and 20.

Three male and two female specimens of a species of *Campsurus* which is probably *C. cuspidatus* were taken at Palitla, San Luis Potosi, Mexico, on Dec. 19, 1940 (A. Carr). These were sent to me by Dr. Lewis Berner to whom one male and one female specimen have been returned, the others remaining in my personal collection. Only males of this species have hitherto been known. Eaton's very brief description is as follows: "Imago (dried), ♂. Pronotum mouse-grey, tinged slightly with greenish. Abdomen smoky-white above, yellowish-white beneath. Wings transparent, whitish throughout. Length of body 10.5, wing 11 mm. Hab. Guatemala (De Selys-Longchamps Mus.). This species is easily recognizable by the cuspidate outline of the subgenital plate". Since Ulmer's more detailed redescription (1942) does not coincide in all points with the Mexican form, it seems well to present a short account of the latter. Differences in coloration may be due to the manner in which the specimens have been preserved, those from Mexico being in alcohol. However, the mode of preservation does not affect venational features, such as the position of MP_2 of the fore wing in relation to CuA. Of the type specimens, Ulmer says: "M_2 scheint aus Cu_1 zu entspringen", etc. This feature is shown in his Fig. 19a. Venation of the hind wings corresponds well with Ulmer's figure, but in only one of the ten wings of the Mexican forms does MP_2 of the fore wing seem to arise from CuA basally. Rather, in nine of these wings MP_2 ends parallel to CuA, slightly nearer to CuA than to the MP intercalary, connected by cross veins to each of these. In this respect, the Mexican specimens resemble *latipennis* Walker, while in the type specimens this feature is similar to *albifilum* Walker, as shown in Ulmer's figure. As Traver has indicated (1947), the relationship between MP_2 and CuA is not as constant within a species as Needham and Murphy

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(1924) believed it to be, nor is this feature always correlated with presence or absence of a prothoracic hump. Such a hump *is* present in the types of *cuspidatus,* presumably (Ulmer says: "Pronotum sehr verlängert"), likewise in the Mexican specimens.

Male imago (Mexico): Body 10–10.5 mm.; fore wing 11 mm. Head purplish black above; eyes black; ocelli ivory white, bases black; basal segments of antenna yellowish with considerable grayish shading, filament pale.

Pronotal hump extends over posterior margin of head. Pronotum grayish in mid-area, median line narrowly darker; yellow laterally in posterior half, this area partially divided by a narrow dark submedian line; narrow blackish lines along lateral margin of hump and laterad of the yellow area; two dark transverse dashes on posterior margin, one each side of median line. Anterior margin of prosternum brownish. Meso- and metanota yellowish brown, joinings of sclerites narrowly brownish; some gray shading just anterior to mesonotal scutellum. Two oblique brown streaks anterior to fore wing, on pleura; antero-lateral margin of mesonotum brown. Pleura and sternum concolorous with mesonotum.

Fore legs grayish above, purplish streak at base; femur paler ventrally except at margins, yellowish area near base; black spot at base of tibia; tarsal joinings pale.

Wings white. In fore wing, humeral cross vein, C, Sc and R purplish brown, these longitudinals somewhat paler distally; other longitudinals as far as MP_2 faintly colored; other veins pale. In hind wing, humeral cross vein and basal third of Sc purplish brown. Venation as in Fig. 1.

Background of abdominal tergites yellow, apicals tinged with orange; pale median line. Gray submedian streak on each middle tergite, rather irregular; continued posteriorly on 3 and 4 at right angles toward pleural fold, on 5–8 extending obliquely toward antero-lateral angle; in angle between oblique and submedian streaks a pale oval area enclosing a gray spot. On tergites 1 and 2 a gray somewhat triangular blotch each side of median line. Posterior margins of 9 and 10 narrowly dark brown, dark submedian lines on each; narrow dark dashes on 8 along pleural fold. Sternites pale yellow: lateral patches deeper yellow; ganglionic areas whitish. Tails white. Genitalia pale yellow; see Figs. 3, 6, 7 and 9 for shape of these in different aspects.

Female imago: Body 11 mm.; fore wing 15 mm. Head and thorax much as in male. Fore legs darker in color, blackish brown. Fore wing with veins more conspicuous because darker in color; costal margin definitely tinged with purplish brown; both longitudinal and cross veins as far back as CuA brownish basally and in disc of wing, paler toward outer margin; hind wing much as in male. Abdomen deep yellow except that apical tergites are pale reddish brown. Tergites quite widely black on posterior margins, less pronounced on 1 and 2 which are heavily shaded with dark gray in middle area, leaving paler lateral portions and a pale transverse streak surrounded by gray on tergite 2. Pale median line faintly indicated on middle tergites. Sternites unmarked; subanal plate narrowly black on apical margin. Tails whitish.

Dr. Berner says of the area in which these Mexican specimens were collected: "Five miles north of Tomazunchale at Palitla, San Luis Potosi. A small swift to moderate clear stream with a rock strewn bottom. Abundant green filamentous algae. Mayflies abundant in swift reaches. Stream flowing through tropical terrain; ferns, orchids, bromeliads, vines abundant".

Traverella presidiana (Traver)

Thraulus presidianus Traver, 1934, J. Elisha Mitchell Sci. Soc. 50: 199–200. Traver, 1935, *In Biology of Mayflies:* 555; figs. 146 and 147.

Traverella presidiana (Traver), Edmunds, 1948, Proc. Biol. Soc. Wash. 61: 143.

Two male imagos and one female imago of the genus *Traverella* are among specimens sent to me by Dr. Berner. Although there are certain minor differences between these males and the holotype of the above species, I believe that these three specimens should be placed in *presidiana*. *T. presidiana* was described from a single male taken at Presidio, Texas, the specimen lacking both middle and hind legs as well as genital forceps. The female has not been described. Additional notes on this species are therefore desirable. It will be noted by comparison of the new figure of the genitalia with that of the holotype given in *Biology of Mayflies* that the slender processes dependent from the penes were evidently distorted in the holotype specimen; in both of the recently acquired males these processes are straight, not S-shaped. Additional notes are drawn from these two males.

Cross veins in fore wing of male somewhat more numerous than in the holotype, especially in the apical portion; here also are 10–12 very faint costal cross veins before the bulla, not indicated for the holotype. A comparison of Fig. 4 of this paper with Fig. 147 in *Biology of Mayflies* shows that more cross veins are present in the hind wing also, although the number and arrangement of these varies somewhat in the wings of the two Mexican males. A slight sexual dimorphism in the hind wing is seen here, as indicated in Figs. 4 and 5; wing of female longer and relatively narrower, the stem of Rs much shorter than in male, area beyond fork longer and narrower. A similar dimorphism occurs in *T. ehrhardti* but is not noticeable in *T. albertana.*

Male imago: Body 7 mm.; fore wing 8 mm.; fore leg 8 mm. Upper portion of eyes large, oval to round, contiguous apically, deep orange in color, concealing most of head and part of pronotum. Thorax rather dark reddish brown. Black lateral and posterior margins on pronotum; black submedian streaks. Mesonotal shield outlined in black; pale median and submedian lines; scutellum likewise black-margined but not itself black. Black lines above bases of middle and hind legs. Basal segments of all legs dark reddish brown. All femora light yellowish to reddish brown, with rather wide blackish median and apical bands which are least well defined on the fore femur and most prominent on the third. Fore tibia very pale reddish brown, knee darker; second and third tibiae yellowish, knees faintly brown-shaded. All tarsi pale yellowish. Fore tarsal segments range in order of length as 1, 5, 4, 3, the latter subequal to 2. Basal portion of forewing red-tinged; longitudinal veins pale amber, deeper in color near base, more distinct than cross veins; stigmatic areas of costal and subcostal spaces with fine granulations. Hind wing very faintly red-tinged at extreme base only; C, Sc and R_1 amber from base to costal angulation, likewise cross veins in this area. Middle abdominal segments pale yellowish, translucent, venter slightly deeper yellow than dorsum; apical segments opaque, reddish brown. Tergite 1 dark gray, likewise posterior half of 2; posterior ¾ of tergites 6 and 7 paler gray. All tergites narrowly dark gray on posterior margins. Pale middorsal streak on all tergites. Anterior margin of tergite 8 narrowly pale. Small grayish spots or blotches on tergites 3–7 above pleural fold, seeming to extend upward and forward from dark posterior margins; faint on 3 and 4, more pronounced on 5–7. Pleural fold margined with reddish brown. Ganglionic area pale; joinings of sternites likewise pale. Forceps whitish; basal joint narrowed near middle, somewhat bowed at this point; apical joint narrower than second. Genitalia as in Figs. 2 and 8. Tails yellowish white, narrowly ringed with reddish in basal portions.

Female imago: Body 7 mm.; fore wing 8 mm. Head yellowish; oblique brown band on vertex extending from middle ocellus to bases of lateral ocelli. Pronotum marbled with blackish, these markings consisting of an oblique submedian streak from posterior margin to end of a dark band halfway between mid-line and lateral margin, and dark areas along anterior border; lateral, postero-lateral and middle of posterior margin narrowly edged with black. Large pale area on pleura anterior to fore wing base. Wings, legs and remainder of thorax essentially as in male. Abdomen very similar to that of male except for grayish shading occupying most of median area of each tergite, leaving the following areas pale: wide band above pleural fold; antero- and postero-lateral triangles; anterior margins of middle tergites; and mid-dorsal line. On middle tergites, this median pale line is widened into a triangle with base on anterior margin; on all tergites, bounded by grayish submedian streaks. Subanal plate shaded with reddish brown, its apical margin not as deeply notched medially as in the female of *albertana* McD.; indeed, the emargination is so slight as to be barely noticeable. This female specimen I designate as the *allotype* of the species.

Male and female specimens, as described above, taken at Rio Guayalejo, Tamaulipas Province, Mexico, Dec. 22, 1939, by Dr. Lewis Berner. One male in collection of L. Berner; other male and female in private collection of J. R. Traver.

Of the locality in which the specimens were collected, Dr. Berner writes: "Guayalejo River . . . near village of Magiscatzin where river crosses Tampico road. Broad (200–300 feet), deep. Slowly flowing in deeper areas . . . Upstream ¼ mile, river widens and becomes shallow to form rapids; here are many large rocks. . . . Mayflies here were extremely abundant."

Traverella primana (Eaton)

Thraulus primanus Eaton, 1892, Ephemeridae *in* Biologia Centrali-Americana 38: 7, fig. 7. Kimmins, 1934, Ann. Mag. Nat. Hist. Ser. 10, 14: 342, fig. 5. Travers, 1947, Rev. de Entomologia 18(1, 2): 149–150, figs. 2–4.

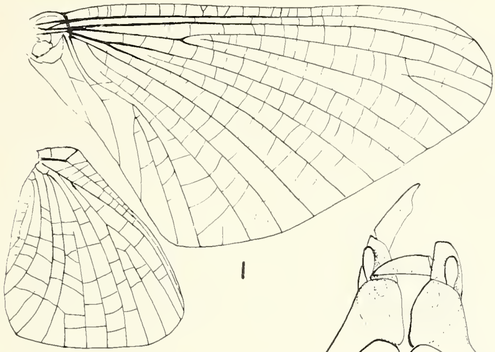
Traverella primanus (Eaton), Edmunds, 1950, Rev. de Entomologia 21(3): 551, figs, 2a, 2b.

Eaton has three specimens from Mexico: two males from Vera Cruz, and a female doubtfully referred to the same species from

EXPLANATION OF PLATE

Fig. 1, *Campsurus cuspidatus,* wings, male. Fig. 2, *Traverella presidiana,* penes, enlarged. Figs. 3, 6, 7 and 9, *Campsurus cuspidatus,* different views of male genitalia. Fig. 4, *Traverella presidiana,* hind wing, male. Fig. 5, same, hind wing, female. Fig. 8, same, male genitalia. Fig. 10, *Traverella primana,* wings.

TRAVER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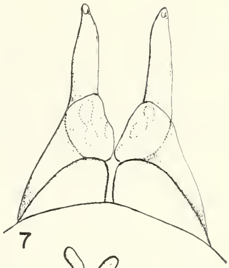
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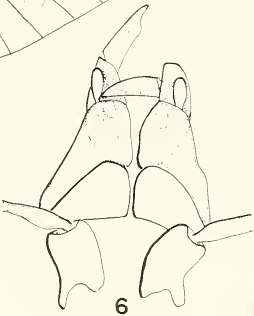
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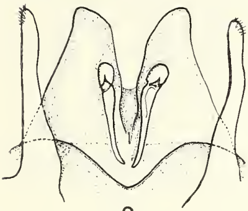
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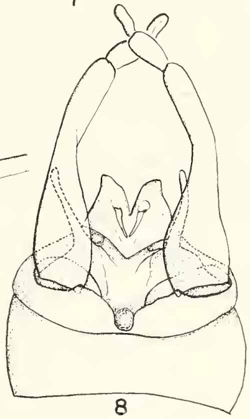
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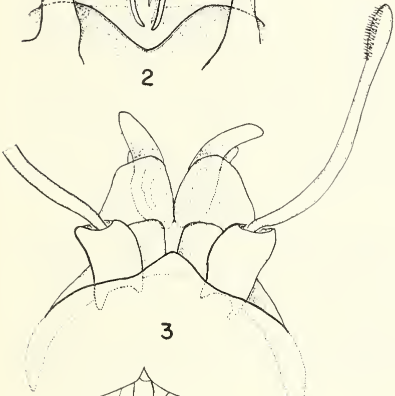
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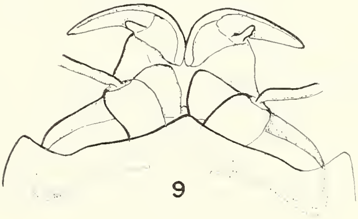
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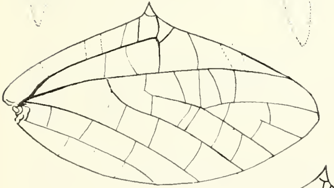
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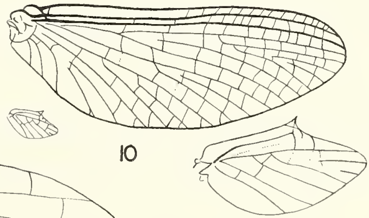
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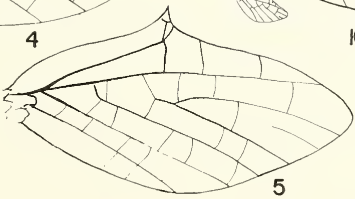
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Tabasco. He figured the hind wings of one male and of one female. Kimmins selected one of Eaton's males as the type, added a few notes on the species, and figured the subanal plate of the female. Edmunds published figures of fore and hind wings of the type male, from sketches prepared for him by Kimmins. Traver had four males from Costa Rica which were referred to *primana;* these showed some slight differences in size and coloration from Eaton's description; hind wing and genitalia were figured. A comparison of the wings of these Costa Rican specimens with the figures of the type male indicates that the former do not differ materially from the latter. It is therefore very probable that the Costa Rican specimens *are primana,* and that the figures of the genitalia published for these specimens should be considered representative of the species, unless and until other specimens are collected which seem closer to Eaton's description. Fig. 10 shows venation of fore and hind wings of one of these Costa Rican males for comparison with Edmunds' figures of the type.

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Ulmer, G. 1942. Alte und neue Eintagsfliegen (Ephemeropteren) aus Süd- und Mittelamerika. Stett. Ent. Zeit. 103: 98–128, 3 pls.

ERRATUM

The name of one species of *Leptohypes* occurring north of the Amazon River was inadvertently omitted from the summary of the previous part of this series. This species is *L. mithras* Traver (1958, Ann. Ent. Soc. America 51: 497). Recognition characters are as follows: Head and thorax reddish brown, purplish brown bands on abdominal tergites; fore claws of male similar, blunt; tails yellowish; wings with relatively few cross veins; hind wings present in *both* sexes; *no membranous processes* from scutellum.

Nemotelus communis Hanson on Goldenrod.—Small black Stratiomyidae flies of the genus *Nemotelus* were present by the thousands, on a blossoming goldenrod patch about one rod by 2 rods in size, a few miles east of Duchesne, Utah, on June 29, 1954. Often 5 to 12 were present per inflorescence. Several thousand specimens were collected, sometimes at the rate of about 200 to 400 per sweep before the flies became disturbed. By the time I emptied the insect net, several thousand specimens again had settled down on the blossoms. Wilford J. Hanson (University of Kansas, Science Bulletin 38: 1376–1377) used part of this series (holotype male, allotype female and 30 males and 30 females as paratypes) to describe the species. Checking of this same goldenrod patch during subsequent years, at full-bloom growth stage and at other times, has yielded only occasional specimens, or usually none at all. —GEORGE F. KNOWLTON, Logan, Utah.

TWO GENERIC SYNONYMS IN THE SIPHLONURIDAE (EPHEMEROPTERA)

By George F. Edmunds, Jr.: University of Utah[1]

The generic name *Andromina* was proposed by L. Navas (1912, Rev. Russ. Ent., 12: 416) for the single species *A. grisea* Navas, known presumably from one specimen from "Okeanskaja," near Vladivostok in Siberia, July 29, 1910, Berger. The identity of this form never has been established by subsequent workers. At my request, Dr. Olga Tshernova kindly examined the type specimen in the Zoological Institute at Leningrad to determine its identity. She has written that the specimen is a subimago female with one hind leg only. The subimaginal pellicle has pulled away from the contained imago giving the grey color suggested by the name. The specimen has wing venation typical of *Siphlonurus* and ventral U-shaped markings on the sternites can be seen through the cuticle. Such markings are found commonly on Palearctic species of this genus.

Hence, the generic name *Andromina* must fall as a synonym of *Siphlonurus* with the **new combination** *Siphlonurus griseus* of doubtful validity. Further study of the type and comparison with fresh material from the type locality possibly may lead to the identity of this species.

The generic name *Chimura* was established by L. Navas (1915, Ent. Mitteilungen 4: 149–150) for the species *C. aetherea* Navas from Kyoto, Japan, June 4, 1908, de Guerne. The type specimen in the Navas collection has not been located for study, but from the description and drawings of the cubital and stigmatic area of the forewing and the male genitalia, it is apparent that *aetherea* is a valid species in the genus *Ameletus*. The figures of the male genitalia resemble those of the species *A. validus* McDunnough found on the American Pacific Coast region from California to Alaska. Apparently it was the practice of Navas to make his drawings freehand and without the aid of microscope slide preparations. The quality of his drawings varies greatly, so no great reliance can be placed on them. But the close concurrence of the drawings with the same structures in *Ameletus*, especially *A. validus*, demands that the generic name *Chimura* be placed as a synonym of *Ameletus*, with the **new combination** *Ameletus aetherea* (Navas) as a valid name.

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[1] The research on which this paper is based was supported by a grant-in-aid from the National Science Foundation (NSF G-4995).

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VOL. LV APRIL, 1960 No. 2

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. LV APRIL, 1960 No. 2

A CASE OF HYBRIDIZATION IN PLECOPTERA[1]

By John F. Hanson, Amherst, Mass.

In a paper published in 1942 I commented on the difficulty of distinguishing the females of two closely related species, *Allocapnia maria* Hanson and *A. minima* (Newport), from each other. Although the greater percentage of the females can be securely identified, a small number from nearly every collection is troublesome. It is comforting to note that I am not alone in my dilemma; the insects themselves seem to be having some difficulty with discrimination. Since hybridization has probably not been detected previously in Plecoptera, the present case is worthy of note.

Before discussing the hybrid forms, it is first necessary to show that two distinct species are indeed involved. Even though *maria* and *minima* may possibly vary structurally in different parts of their geographic ranges, the two species are so distinct in the male sex that any series of specimens may serve to illustrate their basic differences. Nonetheless, for the following presentation of species differences, care was taken to minimize the chances of including hybrids by selecting specimens from streams in which only one or the other species was taken. A dozen males of *maria* from Fort River in Amherst, Massachusetts, and an equal number of males of *minima* from the Connecticut River in Sunderland (near Amherst) were used. Any structural differences which occur could hardly be interpreted as geographic or altitudinal in origin since the specimens were collected within a radius of five miles and at a single altitude. Ecological differences, however, do exist between Fort River and the Connecticut River and could possibly affect some structures.

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[1] Contribution No. 1333 from the entomological laboratory of the University of Massachusetts. Supported by NIH Grant E-1442-(C3), U. S. Public Health Service.

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HANSON Plate I

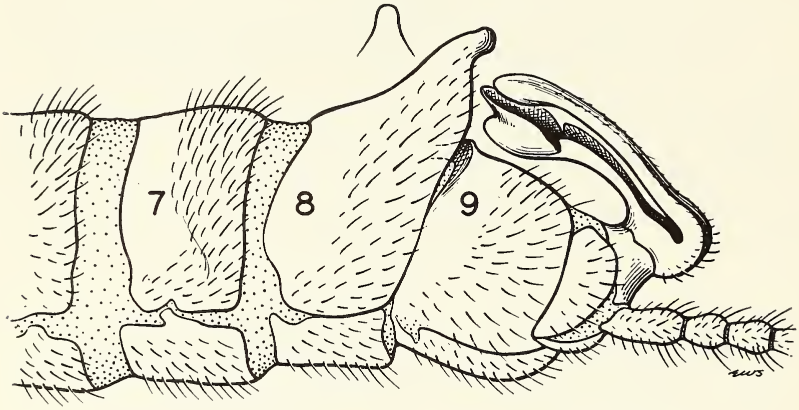


Fig. 1 Allocapnia minima ♂

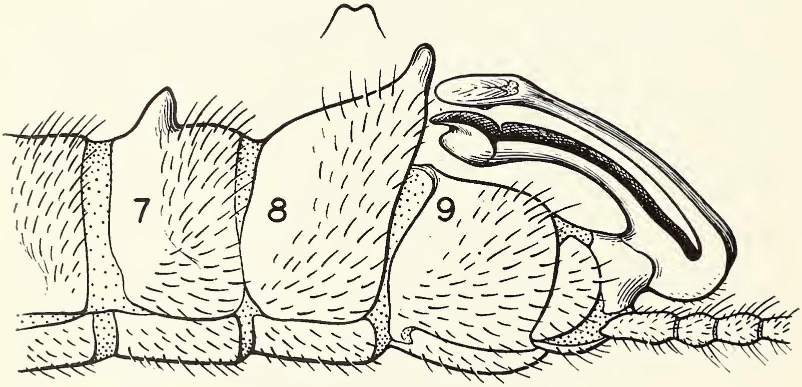


Fig. 2 Allocapnia maria ♂

EXPLANATION OF PLATES I AND II

Fig. 1, *Allocapnia minima* male terminalia, lateral view. Fig. 2, *A. maria* male terminalia, lateral view. Figs. 3, 4, 5, *A. minima* × *maria* hybrids, showing different degrees of intermediacy.

HANSON Plate II

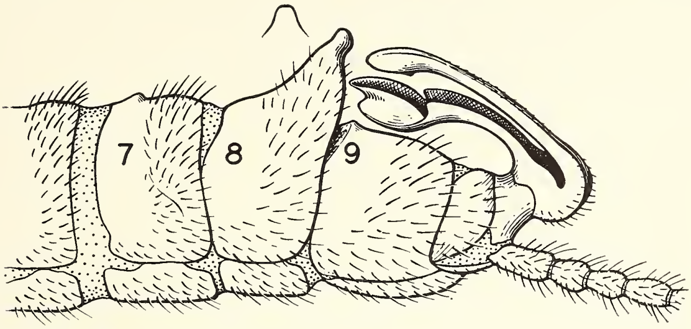


Fig. 3

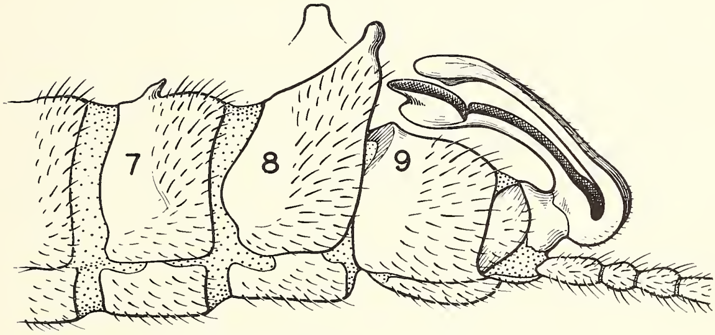


Fig. 4

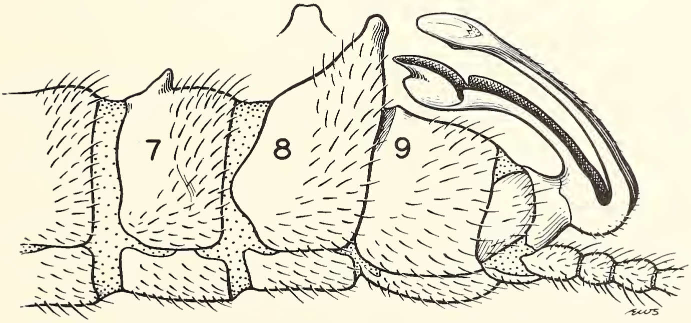


Fig. 5

Hybrid Specimens

Though the females of *maria* and *minima* are distinguishable only by a single genital character, the males show marked differences in their terminalia and exhibit some wing length differences, too. The dissimilarities in the terminalia (Figs. 1 and 2) involve: (1) presence versus absence of a dorsal process on the seventh abdominal segment, (2) shape and direction of the dorsal process on the eighth abdominal segment, (3) length of the dorsal arm of the supraanal process, and (4) appearance of the distal dorsal surface of the latter.

The wings of *minima* seem, in general, to be longer than those of *maria*. A slight difference is exhibited even in the Sawyerville, Quebec, habitat where the *inter*specific difference could possibly have been significantly reduced by introgression (Fig. 6). A much greater *inter*specific difference exists between two local populations in Amherst and Sunderland, Massachusetts (Fig. 7), but this could well have been produced by ecological differences between the two sites rather than by genetic differences between the two species. Certainly, ecological or geographic differences have a considerable effect on wing length. This is shown by a comparison of the fore wings of specimens of *minima* from Sunderland, with those of the same species from Worthington, Massachusetts (Fig. 8). Such great *intra*specific variability of wing length renders this feature practically useless for distinguishing the two species, even if a genetically based difference could be demonstrated.

The fact that *maria* and *minima* exist sympatrically in New England and eastern Canada without losing their individual identities is additional convincing evidence of their separate species status.

Collection data indicate that a difference also exists between the two species in their ecological requirements, as would be expected. Even though very frequently both species are taken at the same stream, only rarely are both abundant at any given stream (Fig. 10).

It appears then that the species status of *Allocapnia maria* and of *A. minima* is quite as secure as the taxonomic status of any other Plecoptera.

HYBRID SPECIMENS

If *Allocapnia maria* and *minima* are as distinct from each other as I have indicated, then it would seem reasonable that hybrid specimens should be recognized easily. This is indeed true of some of the specimens; they are distinctly intermediate in several characteristics. However, since the hybrids form a graded series between the two parent species, and there are thus some specimens exhibiting only minor differences from one or the other of the parent species, it is often difficult to know whether a specimen is at the fringes of normal variation of one of the species concerned or a hybrid product of them. I have, therefore, divided the following treatment into two sections. Specimens that seem undeniably to be hybrids are discussed first.

In the single stream in which both *maria* and *minima* were found coexisting in abundance (Sawyerville, Quebec), 10 male specimens provided a graded series between these two distinct species. In Figures 3, 4, and 5, illustrating three of the intergrades, it will be seen that several characteristics are affected by the presumed interspecific mating. The specimen shown in Figure 3, for example, which has been only slightly "tainted" by *maria* "blood" exhibits (1) the development of a tiny protuberance on abdominal segment seven, (2) a broadening of the eighth abdominal tergal process, (3) a greater tendency of this process to project upward than is typical of *minima,* and (4) a lengthening of the dorsal arm of the supraanal process. Figures 4 and 5 show other cases of hybridization in which not only the above-mentioned characters appear successively more strongly influenced by *maria* but the dorsal surface of the tip of the supraanal process is modified, approaching the condition in *maria.* The length of the supraanal process, being well suited to measurement, has been used in Figure 9 to illustrate graphically the intermediacy of the hybrid specimens. In most of the specimens all of the characters mentioned are similarly clearly intermediate between the two parent species.

Because of the great variability in wing length in the parent species and the small number of hybrid specimens available for study, no conclusion as to the effect of hybridization on wing length is justified (Fig. 8).

Since both parent species have been abundantly collected in the Northeast, and yet the intermediates described above have been discovered only once, it would appear that hybridization is rather rare. Since the two species are sympatric and simultaneously present as adults, geographical or temporal factors can probably not provide important isolational mechanisms. On the contrary, the fact that the two species are rarely found simultaneously abundant in a single stream indicates that ecological isolation is probably very important. This interpretation is strengthened by the apparent lack of any deterrent to hybridization in the single stream where both species were found abundantly. In this instance 10 out of 52 males collected were hybrids. Further evidence of the im-

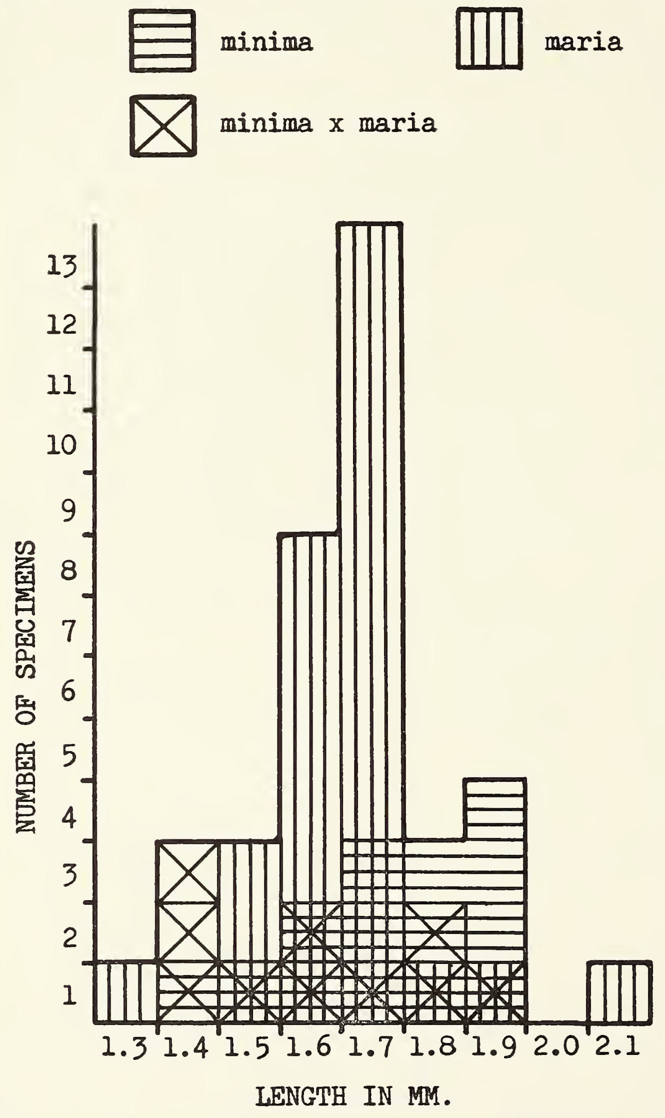


Fig. 6. FORE WINGS OF A. MINIMA, A. MARIA AND HYBRID FROM SAWYERVILLE, QUEBEC

Fig. 7. FORE WINGS OF A. MINIMA FROM SUNDERLAND AND A. MARIA FROM AMHERST, MASSACHUSETTS

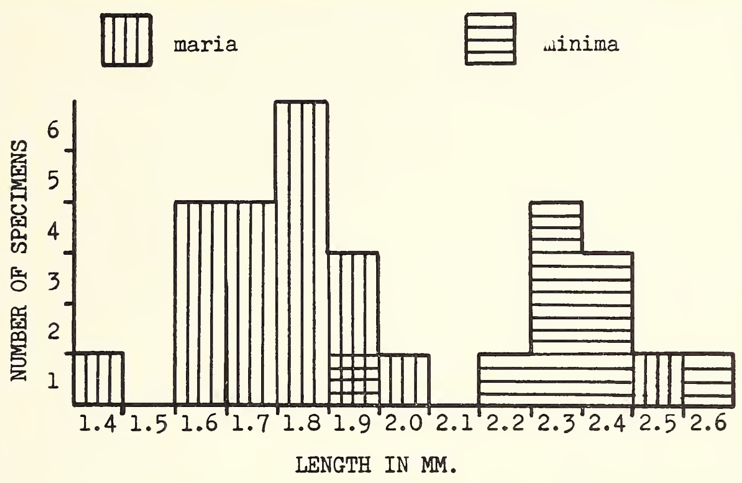
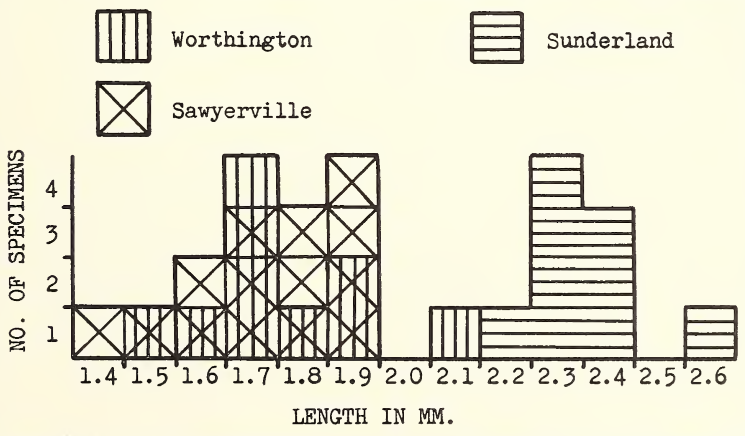


Fig. 8. FORE WINGS OF A. MINIMA FROM SUNDERLAND AND WORTHINGTON, MASS., AND SAWYERVILLE, QUEBEC



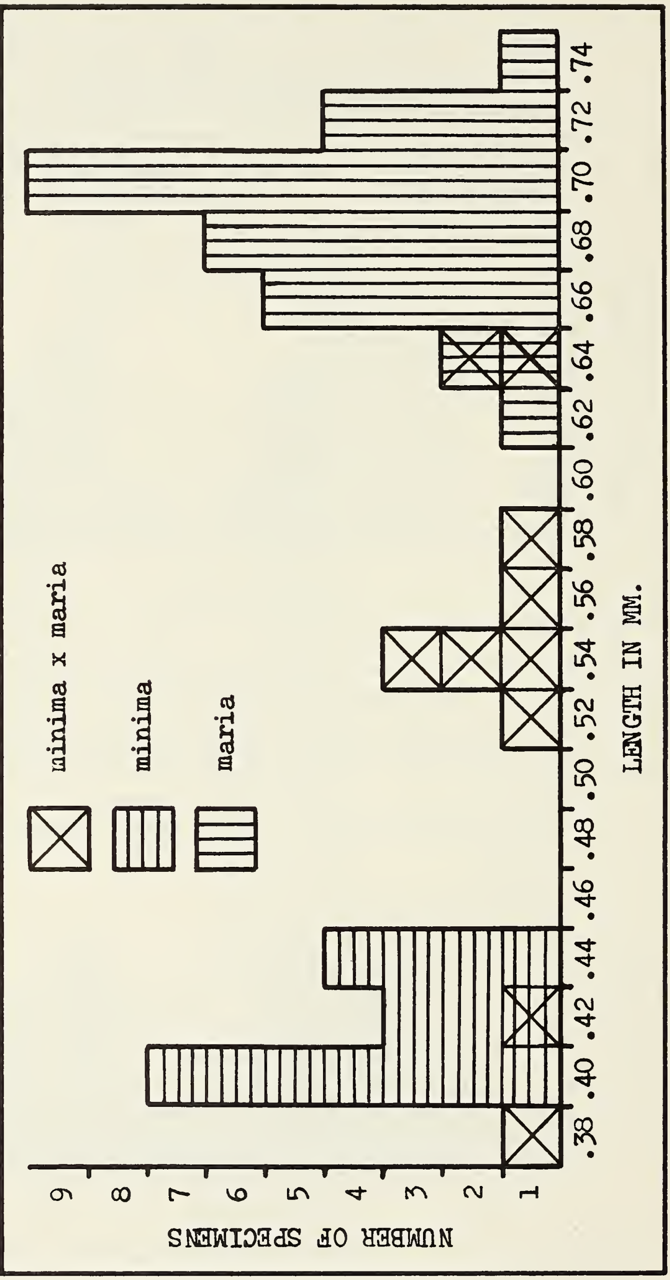


Fig. 9. SUPRAANAL PROCESS OF A. MINIMA, A. MARIA AND HYBRID FROM SAWYERVILLE, QUEBEC, ONLY

portance of ecological isolation exists in the results of the study presented immediately below.

INTROGRESSIVE HYBRIDIZATION

In addition to the 10 specimens quite confidently placed as hybrids because of several intermediate characteristics, there are many more specimens which cannot be so confidently placed but yet do present some very interesting features. Particularly in *Allocapnia minima* there are many males that, although they are readily identified as *minima,* seem to have dipped into the *maria* gene pool. This is detectable in only one structure, a process on the seventh abdominal tergite which is normally and conspicuously present in *maria* (Fig. 2) but not in *minima.* The fact that specimens of *minima* bearing such a process (much smaller than in *maria*) have been taken wherever *minima* has been collected, whereas the multiple-character hybrids have been taken only once, undoubtedly has some significance.

It is possible that the rare multiple-character hybrids are an F1 generation. If these are viable, then introgressive hybridization is possible, and with the ecological barrier thus destroyed or minimized, characteristics of *maria* could spread extensively through the *minima* population.

		A. minima		
	No. of males *A. maria*	No. of males	No. with 7th terg. process	% with 7th terg. process
Sunderland, Mass.	0	10	2	20%
Coventry, Vermont	0	31	10	33
St. Gerard, Quebec	0	42	19	45
Stanstead, Quebec	0	131	66	50
St. Malo, Quebec	1	53	9	47
Worthington, Mass.	1	10	5	50
So. Ashfield, Mass.	44	5	3	60
Sawyerville, Quebec	28	14	11	80

Fig. 10. Seventh tergite process versus relative abundances of *A. minima* and *A. maria.*

With such introgressive hybridization, one would expect to find that the greater the relative abundance of *maria* in a given habitat, the greater the frequency of occurrence in *minima* of the process of the seventh tergite. Such a relationship is detectable, as can be seen in Figure 10, even though the numbers of specimens available for study are inadequate for precise reliability. Only presence or absence of the process is indicated in Figure 10. Its size, also, provides evidence of a correlation of this structure with the relative abundance of the two parent species. In streams where *maria* has been taken in extremely low numbers, or not at all, the 7th tergite process of *minima* appears as a tiny lump, the detection of which requires over 100 power magnification. The frequent presence of such a small lump amongst specimens of *minima* from habitats where *maria* has not been taken is cause for some concern. However, probably *maria* will be found to be present in these habitats when more extensive collecting is done.

ACKNOWLEDGMENTS

I wish to express my appreciation to Mr. E. W. Smith for the fine drawings, to Drs. C. J. Gilgut and W. D. Tunis for their critical reading of the manuscript and to Miss Eleanor Graves for doing the typing and taking care of other mechanical details.

Misplaced Captions on Seitz' Noctuid Plate.—In Seitz' Macrolepidoptera, Vol. VII, Plate 49 (Schinia-Acidaliodes) Line e, the species names, beginning with *ferricasta,** are misplaced, as printed.

Each name should move one place to the right to match the correct illustration. The name *ferricasta* is under an illustration of the melanic female of *arcifera.*** It belongs one place to the right, replacing *limbalis*. Similarly, *limbalis* should replace *olivacea; olivacea* should replace *spinosae, spinosae* replacing *camina*. *Camina* is then left without an illustration but this does not matter as it is a synonym of *spinosae*.

As several of the species are not commonly available in collections for comparison, dependence on these illustrations as captioned would result in incorrect determinations.—ROWLAND R. MCELVARE,

---

* *Ferricosta.*

** *Arcigera.*

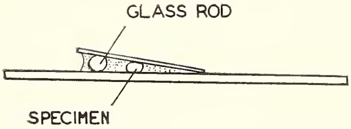
MANIPULATION OF SPECIMENS ON SLIDES

By Milton Savos, Springfield, Mass.

While the writer was in France at the Université de Nancy engaged in a taxonomic study of the Class Symphyla, he was introduced to a convenient method of preparing temporary whole mounts of small elongate arthropods. These mounts have a distinct advantage over other temporary or "permanent" slide preparations in that the specimen can be manipulated for study from all sides.

The materials required are simple and readily available in any laboratory. They consist of microscope slides, square cover slips, a saturated solution of potassium hydroxide, a mixture of 1 part glycerin and 10 parts water, and a series of fine glass rods that can be made by drawing out glass tubing.

The specimen is mounted on the slide in a drop of the glycerin-water mixture. A glass rod of a slightly greater diameter than that of the specimen is placed along side of it. Then the cover slip is added so that one end of it rests on the slide and the other end is supported by the glass rod. A drop or two of the potassium hydroxide solution may be added to clear the specimen; additional drops of the gylcerin-water mixture may be added until the area under the cover is flooded. The specimen is then ready for examination.



With this mount a specimen can be rolled and brought to rest in almost any desired longitudinal position for examination simply by pushing either end of the cover slip with some appropriate instrument. It should be pointed out that the diameter of the glass rod is very important. If it is less than that of the specimen, the latter will be jammed between the cover slip and the slide and hence cannot be rolled without risk of injury. If the diameter of the glass rod is much greater than that of the specimen, the latter will float about out of control. Practice is required to attain proficiency.

The writer has had success with specimens ranging from 0.5 to 8.0 mm. in length and has seen the method employed in studies on even larger specimens such as *Campodea*. With specimens up to about 4 mm. in length, the high-dry and even oil immersion objectives can be used to study the parts of the body lying next to the cover slip.

ON THE IDENTITY OF MINORISSA ALATA THOMAS, 1874, AND ATRACTOMORPHA CONGENSIS SAUSSURE, 1893 [NOMEN NUDUM] (ORTHOPTERA: PYRGOMORPHIDAE)

By D. Keith McE. Kevan[1]

Thomas (1874) described from a single, rather poorly preserved female specimen of unknown origin a species of pyrgomorph which he placed in the South American genus *Minorissa* Walker, 1870. Why he did so is not clear, but, since he considered (without giving his reasons) that it was "probably from some part of South America", it would seem that he merely placed the specimen in what appeared to him to be the most likely South American genus, apparently without giving any thought to the possibility that the specimen might belong to an Old World genus.

Minorissa alata Thomas, 1874, has never been referred to in the literature since its description; it was omitted by Bolívar (1884; 1905; 1909) in his works on the Pyrgomorphidae and finds no place in Kirby's monumental catalogue of the Orthoptera (1910). Hebard (1927) omits the species in his paper fixing types of Orthoptera described by Thomas; Rehn (1953) does not mention it when discussing the only other species of the genus, *M. pustulata* Walker 1870[2]; and the type has been presumed lost.

Recently (May, 1959) while examining the Orthoptera collection of the U.S. National Museum, through the kindness of Dr. A. B. Gurney, I discovered, tucked away amongst some old material, a specimen standing over a label in Caudell's hand, "*Minorissa alata* Thos." There was no doubt that this was the missing type of the species, since it agreed fully with Thomas' description[3]. In addition, it had a single, small data label added: "S. America", in Thomas' hand, and a determination label "*Minorissa alata* Thos."

---

[1] Prof. of Entomology, McGill University, Macdonald College, P.Q., Canada.

[2] Rehn (*l.c.*) refers erroneously to the species as *M. pustulosa* (although he correctly gives *pustulata* as the type species of *Minorissa*), and further, gives the wrong page reference to the original description.

[3] More accurate measurements than are given by Thomas are: Length (excluding tegmina), 36.9; tegmina (distorted), 23.9; pronotum, 7.0; fastigium verticis, 2.9; hind femur, 15.2 mm.

The specimen does not belong to the genus *Minorissa,* but to *Atractomorpha* Saussure, 1862, a genus confined to the Old World, including Australasia, one species of which (currently known as *A. ambigua* Bolívar, 1905[4]) has been introduced into the Hawaiian Islands.

The systematics of this genus are at present in a very confused state, but a preliminary revision is in press (Banerjee and Kevan, 1960). It may, however, be stated here that the type of *Minorissa alata* belongs to the species commonly known as *A. bedeli* Bolívar, 1884, which has been synonymized by Beĭ-Bienko (1951) with *Truxalis lata* Motschoulsky, 1866. A comparison of the types of *Truxalis brevicornis* Thunberg, 1815, and *A. bedeli,* however, shows that these are also synonymous. The availability of Thunberg's name is discussed by Banerjee and Kevan (*op. cit.*). The synonymy is as follows:

T[*ruxalis*] *brevicornis* Thunberg, 1815, Mém. Acad. Sci. St. Péterb. 5: 264 [*nec* Fabricius, 1775 = *Gryllus brevicornis* Linné, 1764]

Truxalis lata Motschoulsky, 1886, Byul, Mosk. Obshch. Prir. 39: 181—*syn. nov.*

Minorissa alata Thomas, 1874, Bul. U.S. geol. geogr. Surv. Terr. 1: 63—*syn. nov.*

Atractomorpha Bedeli Bolívar, 1884, An. Soc. esp. Hist. nat. 13: 64, 69, 495—*syn. nov.*

The correct name is thus *Atractomorpha brevicornis* (Thunberg) —*comb. nov.* The species occurs in China, Japan and certain adjacent territories.

Since Thomas implied that *M. alata* was probably South American in origin, the possibility of the introduction of a species of *Atractomorpha* into Continental America cannot be refuted absolutely (another species has become established in Hawaii), but the evidence is too slender to attach any importance to it. One should perhaps mention, in this connection, however, that there is also an old, alcohol-preserved female of *A. brevicornis* in the Hamburg Museum labelled "Buenos Ayres, Ruscheweigh ded.", and that in the U.S. National Museum collection are three male specimens of *Atractomorpha* bearing the data label "Nogales, Mex[ico], June 31 [*sic!*][5], 1919. Coll. F. J. Dyer". Thus we have a further suggestion that the genus has been introduced into America.

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[4] Comparison of types shows this to be a synonym of *A. sinensis* Bolívar, 1905 (Banerjee and Kevan, 1960): *A*[*tractomorpha*] *sinensis* Bolívar, 1905, Bol. Soc. esp. Hist. nat. 5: 198, 205 = *A*[*tractomorpha*] *ambigua* Bolívar, 1905, *ibid.*: 198, 209—*syn. nov.*

[5] June 13?

Mr. Francis J. Dyer, whose name appears on the data labels of the three males, was American Consul in Nogales, Mexico (just south of Nogales, Arizona) and both he and his wife appear to have been keenly interested in natural history, for they sent many plants (especially cacti), reptiles and insects to the U.S. National Museum, as the Museum records show. Insects of several orders are recorded as having been collected by a zealous house-boy at night on the insect screens of Mr. Dyer's residence on or about the date indicated on the data labels[6]. The immediate neighbourhood of Nogales is arid and unsuitable for the establishment of *Atractomorpha,* which prefers more humid situations, but it is understood from colleagues who have been there, that moister areas exist not too far away for the insects to have flown to light.

Unfortunately for the theory of introduction of *Atractomorpha* into America, The Nogales specimens belong to the African form at present known as *A. gerstaeckeri* Bolívar, 1884[7], and it seems that, although the data labels are genuine enough, they have been attached to the wrong specimens. These latter have apparently been alcohol-preserved and resemble closely some material, also in the U.S. National Museum, from Liberia. The data label on the Hamburg specimen has presumably also been misplaced.

The introduction of an Asiatic species into western America is one thing, but the early introduction of two species, one of them Asiatic and to the south-east coast of South America and the other

EXPLANATION OF PLATE

Figs. 1, 2. ♀ Type of *Minorissa alata* Thomas (1¼ ×) : 1, dorsal; 2, lateral. Figs. 3–6. ♂ & ♀ *Atractomorpha gerstaeckeri* Bolívar labelled "*Atractomorpha congensis* Sauss." [*nomen nudum*] by H. de Saussure (1¼ ×) : 3, 4, selected representative ♂; 5, 6, female from same series; 3, 5, dorsal; 4, 6, lateral. [Photographs: S. K. Banerjee].

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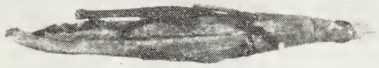
[6] A letter from Mr. Dyer from Nogales, Sonora, Mexico, dated June 17, 1919, to Mr. W. de C. Ravenel of the U.S. National Museum notes that material sent ". . . also includes a very few insects, dry, bees, etc. Among the insects taken are quite a number, some minute, taken on the house screen and around lights at night . . ."

[7] Regarded as a subspecies of *A. acutipennis* (Guérin-Méneville, 1844) by Banerjee and Kevan (*op. cit.*).

KEVAN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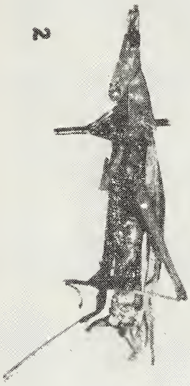
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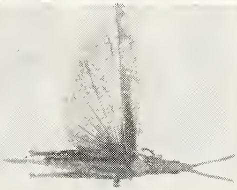
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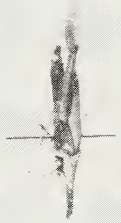
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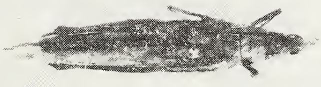
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African and to an unfavourable inland locality remote from commerce, is quite another. We cannot, therefore, accept *Atractomorpha* as an introduced American insect, but the above information may conceivably be of future interest.

In concluding, it might not be inappropriate here to clear up another obscure reference to the genus *Atractomorpha.* Saussure (1893) listed a species of the genus as *A. congensis* from "Congo". The species was never described but is referred to by Johnston (1956: 751) in his Catalogue of African Grasshoppers as a *nomen nudum.* A male and a female specimen determined by Saussure (in his own hand) as *A. congensis,* together with five additional males, three females and two nymphs (one rather small) belonging to the same series, are also in the U.S. National Museum. There is thus a total of twelve specimens, although only eleven were originally recorded by Saussure, who presumably ignored the smaller nymph[8]. The present specimens all bear a label "Congo" [in handwriting] and another "U.S.N.M.Acc.—" [printed]. The males and females also bear the handwritten number "2" or "3" respectively. One male, selected here as representative of the series ("pseudotype"), has the left tegmen and hind wing spread.

All the above material is referable to *A. gerstaeckeri* Bolívar, so that it is now possible to establish the following synonymy for that species:

Atractomorpha Gerstaeckeri Bolívar, 1884, An. Soc. esp. Hist. nat. 13: 64, 66, 495.

Atractomorpha congensis Saussure, 1893, Proc. U.S. nat. Mus. 16: 581—*nomen nudum, syn. nov.*

Further synonymy is discussed by Banerjee and Kevan (*op. cit.*).

SUMMARY

(1) *Minorissa alata* Thomas, 1874, is a synonym of *Atractomorpha brevicornis* (Thunberg, 1815) and its suggested origin in S. America is discredited.

(2) *Atractomorpha congensis* Saussure, 1893, a *nomen nudum,* refers to *A. gerstaeckeri* Bolívar, 1884.

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[8] It might be that he omitted both nymphs and retained an eleventh adult for himself, but there is no evidence of this; there is apparently no specimen labelled *A. congensis* in Saussure's collection in Geneva (Prof. Ch. Ferrière, *in litt.,* 1957).

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A NEW GENUS AND SPECIES OF XYSTODESMID MILLIPED FROM TENNESSEE

By William T. Keeton[1]

During the past five years, three separate collections of an undescribed xystodesmid milliped from Tennessee have been sent to me for study. Although this new species cannot be placed in any of the existing genera, I have hesitated in describing a new genus for it in the hope that the revisionary studies of the Xystodesmidae currently being conducted by Richard L. Hoffman (e.g. 1956, 1958) and by me (1959) would soon result in a clearer picture of the relationships of the various "fontariid" genera. It has become increasingly evident, however, that the problems involved in critical treatments of such important genera as *Apheloria, Sigmoria, Cleptoria,* and *Sigiria* (the genera which, together with a few others such as *Brachoria,* constitute the section of the Xystodesmidae to which the new Tennessee form belongs) are such as to delay indefinitely the completion of those works. Accordingly, I have decided to describe the new genus, but to delay detailed discussion of its affinities until such time as the characteristics of the other groups involved have been clarified.

Hubroria, n. gen.

Diagnosis.—A genus of the "fontariid" group of the Xystodesmidae characterized primarily by the form of the telopodites of the male gonopods, which do not curve in the simple or sigmoid arcs typical of related genera such as *Apheloria* and *Sigmoria;* the short distal portion of telopodite abruptly narrowed, twisted, and curved cephalad in a plane nearly parallel to the body of the animal, in this character somewhat resembling *Brachoria mendota* Keeton but without any trace of a cingulum. Prefemoral spines extremely long and stout, much larger than in any closely related genus.

Moderately large, broad-bodied forms; paranota wide, slightly overlapping, continuing slope of dorsum. Twenty segments; segments 5, 7, 9, 10, 12, 13, 15–19 with repugnatorial pores, these dorsal in position in moderate paranotal swellings, the swellings less pronounced than in many xystodesmid genera. Four antennal sensory cones.

Type species.—*Hubroria picapa,* new species.

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[1] Department of Entomology (Biology Section), Cornell University, Ithaca, New York. The expense of publishing the plate in this paper was paid by the Griswold Fund of the Department of Entomology, Cornell University.

Hubroria picapa, n. sp.

(Figures 1–4)

Type specimens.—Male holotype deposited in the U. S. National Museum; collected by Leslie Hubricht, May 30, 1958, on roadside, 2.3 miles north-northeast of Sunbright, Morgan County, Tennessee. Male and female paratypes in Chicago Natural History Museum; collected by Bernard Benesh, June, 1949, Sunbright, Tennessee. Male paratype in author's collection; collected by Bernard Benesh, June 2, 1952, Burrville, Morgan County, Tennessee.

Description.—The diagnosis is that given for the genus. Length of holotype, 43 mm.; width, 10.7 mm.; lengths of male paratypes, 44 and 42.3 mm.; widths, 10.3 and 10.4 mm.; length of female paratype, 46 mm.; width, 10.7 mm.

Vertigial sulcus distinct, ending a little above level of antennal sockets. Antennal grooves moderately deep, the clypeal borders more abrupt than the vertigial. Clypeal margins smoothly curved; clypeal setae numerous, their number very variable but always greater than 20. Labrum with 3 distinct teeth, subequal in length; labral setae variable in number but generally about 20. Antennae long and slender, slightly surpassing caudal margins of 3rd tergites when pulled back over body; 2nd articles exceeding lateral corners of clypeus, articles becoming increasingly setose distally; articles in order of decreasing length: 2, 3, 4, 5, 6, 1, 7.

Collum subovoid, its precise shape variable; paranota rounded laterally; anterior margins of paranota set off by distinct submarginal grooves which run from lateral extremes of collum to points opposite vertigial margins of antennal grooves.

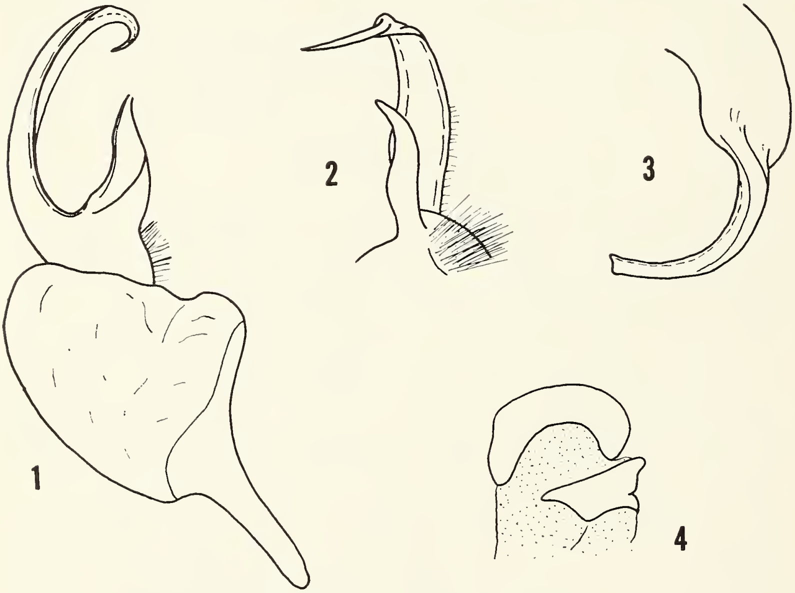
Tergites coriaceous, those of 2nd segment with rounded paranota; 3rd tergite showing slightly more angle at posterolateral corners of paranota, these angles becoming progressively more evident on succeeding segments, those of tergite 9 and succeeding midbody segments only very slightly produced caudad as result of caudal rounded or squared, never acute, borders of paranotal swellings.

Telson subtriangular in dorsal aspect, the apex truncate; a very evident subterminal lateral tubercle on each side. Anal valves coriaceous, with prominent mesal lips. Hypoproct with convex lateral margins meeting at small terminal protuberance; lateral tubercles subterminal.

Pleural areas of prozonites smooth, those of metazonites very coriaceous. Sternal areas smooth, those of metazonites of immediately postgenital segments deeply grooved medially, their posterolateral corners with pronounced swollen areas; both groove and swollen areas becoming much less evident on more caudal segments, where sternal areas are also broader.

Legs long and slender; all podomeres densely setose. Prefemora with long sharp conical distal ventral spines; anterior coxae without such armature, those of segment 10 and succeeding segments with only weak trace of armature. Third podomeres much the longest. Tarsal claws long and distally curved, with a prominent ridge running along dorsal surface and several smaller ridges lateral to it on each side.

Genital processes of coxae of 2nd legpair of male short and truncate, with several setae. Sternum of 3rd legpair with pair of relatively large, longitudinally elongate, confluent processes; sternum of 4th legs with pair of medially confluent digitiform processes extending ventrad almost to level of ventral surfaces of coxae; similar pair of processes between bases of 5th legs in 2 males, but these not confluent; no processes between 5th legs of 1 male; no processes between bases of legs of 6th segment in any specimens, sternal areas of this segment much broader than those of preceding segments, this



Explanation of Plate

Hubroria picapa.—Fig. 1, left gonopod of male, cephalic view. Fig. 2, The same, telopodite portion, mesal view. Fig. 3, The same, distal portion of telopodite, ventral view. Fig. 4, Left cyphopod of female, lateral view of valve and receptacle.

particularly true of wide area between 7th legs.

Sternum between 3rd legs of female very narrow and produced ventrad to form pair of short confluent processes. Sternum between 4th and 5th legs broader, with pair of rounded humps between bases of 5th legs, these humps separated by longitudinal mesal groove. Sternum of 6th segment nearly as wide as those of succeeding segments, without such prominent humps.

Gonopod aperture large and suboval, cephalic border emarginate. Gonopods large, fully exposed in ventral view. Coxae of gonopods connected by membrane and muscle only, no sternal remnant. Prefemora with the usual setose cushion on caudal surfaces; prefemoral spines very long and thick, extending ventrad, then curving slightly cephalad distally; prominent ridge running across cephalic surface of each spine from dorsolateral base to mesal surface about midway of its length and thence to tip of spine; this ridge, together with one running along cephalolateral margin, forming decidedly concave cephalomesal surface on each spine. Arc of each telopodite curving gently cephalomesoventrad from its base, then abruptly narrowed and somewhat twisted (fig. 3), the short distal thinner portion curved cephalad in smooth arc, with narrowly subspatulate end; seminal canal ending on ventral surface of lateral corner of spatulate end. (All directions here mentioned refer to gonopods in fully erect position; gonopods are sometimes held closer to pregenital ventral body surfaces and all directions would then, of course, be changed.)

Cyphopod (fig. 4) with both valves similar in shape and length, each deeply emarginate dorsally; receptacle with lateral and mesal arms similar, cephalic surface (not shown in figure) irregular, forming 3 indistinct lobes, these faintly papillate.

Color faded, but apparently dorsum was dark brown with light paranota, these light areas connected on each tergite by light band running along caudal portion of metazonite.

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A REPORT ON THE BLACKFLIES (SIMULIIDAE) OF DELAWARE.[1] PART I. RECORD OF DELAWARE SPECIES AND AN INTRODUCTION TO A SURVEY OF THE WESTERN BRANCHES OF THE CHRISTIANA RIVER, NEW CASTLE COUNTY.

By Douglas W. S. Sutherland and Richard F. Darsie, Jr.[2]

ABSTRACT

This is the first detailed report (in two parts) on the occurrence of Simuliidae in Delaware. Only three species have been recorded prior to this report, viz, *Cnephia mutata* (Mall.), *Prosimulium hirtipes* (Fries) and *Simulium decorum* Walk. Delaware locality records are given for these and the following species, which are being listed for the first time: *Prosimulium magnum* D. & S., *Simulium aureum* Fries, *S. jenningsi* Mall., *S. tuberosum* (Lund.), *S. venustum* Say, *S. verecundum* S. & J. and *S. vittatum* Zett.

During July, 1958, 21 stations in 12 tributaries of the Christiana River, New Castle County, Del., were searched for presence of blackfly immatures. Of these, 14 were positive. In all 1164 larvae and pupae were collected and 147 of them were reared to adults in the laboratory.

In Part II descriptions of the habitats, a table of blackfly species associations, and a listing of other insect inhabitants are given.

INTRODUCTION

The Simuliidae, or blackflies, are haematophagous insects of considerable importance not only as pests of man and animals but also as vectors of diseases. No comprehensive report of the occurrence of blackflies in Delaware has been published. Recorded here, therefore, are details of the distribution of ten species found in Delaware, followed by data on a concentrated survey of blackfly breeding in the western branches of the Christiana River, New Castle County, Delaware, conducted by the senior author.

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[1] Published as Miscellaneous Paper No. 355, with the approval of the Director of the Delaware Agricultural Experiment Station. Publication 305 and Scientific Article 221 of the Department of Entomology, November, 1959.

[2] Graduate Assistant and Associate Professor, respectively, Department of Entomology, Delaware Agricultural Experiment Station, Newark.

This study is published in two parts, the first dealing with the detailed locality records of Delaware Simuliidae, and the introduction to the survey; while the second part contains the descriptions of the blackfly habitats in the Christiana River system.

To our knowledge, no blackflies were collected in Delaware prior to 1951. In January of that year, a student of entomology, Joseph P. Cann, found blackfly larvae in Centerville, Delaware. Subsequently, collections by Donald MacCreary, Dale F. Bray and H. E. Milliron on January 13, 1951, proved to be *Simulium vittatum* Zett. Between 1951 and 1957, primarily through the interest and efforts of H. E. Milliron, four additional species were collected, viz., *Cnephia mutata* (Malloch), *Prosimulium hirtipes* (Fries.), *Prosimulium magnum* Dyar and Shannon and *Simulium decorum* Walker. However, only *C. mutata, P. hirtipes* and *S. decorum* have been listed in print as occurring in Delaware (Milliron, 1956a, 1956b, 1956c, 1957a, 1957b, 1957c, 1958 and Sutherland 1959). Thus, we are reporting seven species of blackflies for the first time from Delaware.

Milliron (loc. cit.) makes several references to blackflies and their annoying man and animals during late April and early May. He observed *P. hirtipes* and *C. mutata* to be pestiferous in late afternoon and early evening, and more prevalent in New Castle, than in Kent County. *S. decorum* was troublesome at mid-day, and was common in Sussex, less so in Kent, and rare in New Castle County.

The following persons were collectors of blackflies in Delaware and are listed in the species-locality data by their initials: Dale F. Bray (DFB), Marlin S. Conrad (MSC), Donald MacCreary (DM), H. E. Milliron (HEM), Paul F. Springer (PFS), Douglas W. S. Sutherland (DS) and Charles A. Triplehorn (CAT). The authors are indebted to Dr. Alan Stone of the United States National Museum for checking the identification of certain specimens. These are so indicated. All of the adults collected by H. E. Milliron were determined by him.

RECORDS OF DELAWARE SIMULIIDAE

Cnephia mutata (Malloch).—New Castle County: Newark, IV-9-51, 4♀♀ (DFB); IV-13-51, 1♀ (DM); IV-14-51, 4♀♀; IV-15-51, 4♀♀; IV-21-51, 1♀; IV-19-56, 7♀♀ (HEM); IV-28-58, 1♀ (DM); Wilmington, IV-25-51, 1♀ (HEM); Glasgow, IV-20-51, 1♀ (DFB); S. of Townsend, IV-26-51, 2♀♀ (HEM). Kent County: S. of Clayton, IV-26-51, 6♀♀; W. of Cheswold, IV-26-51, 1♀; Petersburg, IV-17-57, 2♀♀ (HEM); Bombay Hook National

Wildlife Refuge, IV-13-54, 1♀ (PFS). Sussex County: Redden State Forest, V-3-56, 4♀♀ (HEM).

Prosimulium hirtipes (Fries).[3]—New Castle County: Newark, IV-1-51, 40♀♀; IV-14-51, 16♀♀ and 1♂; IV-15-51, 30♀♀ and 32♂♂; IV-21-51, 1♀; IV-22-51, 2♀♀; IV-30-51, 1♀ (HEM); Spring, 1952, 1♀ (DFB); IV-15-53, 5♀♀ (CAT); IV-19-56, 3♀♀ (HEM); Centerville, IV-18-51, 1♀ (DM); Glasgow, IV-20-51, 6♀♀ (DFB); IV-15-53, 2♀♀ (CAT); S. of Townsend, IV-26-51, 2♀♀ (HEM). Kent County: S. of Clayton, IV-26-51, 23♀♀ and 1♂; Petersburg, IV-17-51, 11♀♀ (HEM). Sussex County: Redden State Forest, IV-17-57, 6♀♀ (HEM).

Prosimulium magnum Dyar and Shannon.—New Castle County: Newark, IV-14-51, 2♀♀; IV-15-51, 1♀; IV-21-51, 5♀♀; IV-22-51, 1♀ (HEM). Kent County: S. of Clayton, IV-26-51, 2♀♀ and 2♂♂ (HEM).

Simulium aureum Fries.—New Castle County: Glasgow, Muddy Run, VII-14-58, 25 lar.; Glasgow, Sunset Lake, VII-14-58, 4♀♀, 1♂, 26 lar.; Newark, S. Branch of Persimmon Run, VII-19-58, 1♂, 3 pup., 2 lar. (DS).

Simulium decorum Walker.—New Castle County: Newark, IV-22-51, 1♀, (HEM); Pleasant Hill, Pike Creek, VII-12-58, 1 lar.; Glasgow, Zeitler Dam, VII-14-58, 7 pup. and 118 lar. (DS). Sussex County: Georgetown, IV-30-56, 14♀♀ (HEM).

Simulium jenningsi Malloch.—New Castle County: Glasgow, Muddy Run, 1♂, 1 pup. (exuvium) (DS).

Simulium tuberosum (Lundstroem)[4].—New Castle County: Newark, E. Branch of Christiana Creek, VII-11-58, 46 lar.; N. Branch of Persimmon Run, VII-19-58, 2♂♂; S. Branch of Persimmon Run, VII-19-58, 1 lar.; Milford Crossroads, Middle Run, VII-16-58, 1 pup. and 16 lar.; Pleasant Hill, Pike Creek, VII-12-58, 62 lar.; Glasgow, Muddy Run, VII-13-58, 1♂, 6 lar.; VII-14-58, 18 lar. (DS).

Simulium venustum Say[5].—New Castle County: Newark, E.

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[3] It is quite likely that *P. hirtipes* in Delaware is composed of a complex of closely related species; see Syme and Davies (1958) and Davies and Syme (1958).

[4] Identifications confirmed by Dr. Alan Stone (in litt.)

[5] These records represent the *S. venustum* complex and may be *S. venustum, S. tuberosum* or *S. verecundum*. Larvae are either *S. venustum* or *S. verecundum*, and not *S. tuberosum*, since its larvae are distinctive.

Branch of Christiana Creek, VII-10-58, 3 pup. and 18 lar.; N. Branch of Persimmon Run, VII-19-58, 5♀♀, 1♂, 13 pup., 3 lar.; S. Branch of Persimmon Run, VII-19-58, 1 pup., 2 lar.; Pleasant Hill, Pike Creek, VII-12-58, 3♀♀, 23 pup.; Milford Crossroads, Middle Run, VII-16-58, 1 lar.; Glasgow, Muddy Run, VII-13-58, 9♀♀, 16 pup., 51 lar.; VII-14-58, 1 pup.; Porter, Belltown Run, VII-19-58, 9♀♀, 21 pup., 95 lar. (DS). SUSSEX COUNTY: Ellendale, VII-24-58, 16♀♀, 28 pup. (DFB, MSC).

Simulium verecundum Stone and Jamnback[6].—NEW CASTLE COUNTY: Glasgow, Muddy Run, VII-13-59, 7♂♂, 2 pup. (exuviae); VII-14-59, 4♂♂, 4 pup. (exuviae); Porter, Belltown Run, VII-19-59, 3♂♂, 2 pup. (exuviae); VII-20-59, 2♂♂, 2 pup. (exuviae) (DS). SUSSEX COUNTY: Ellendale, VII-24-58, 16♂♂ (DFB, MSC).

Simulium vittatum Zetterstedt.—NEW CASTLE COUNTY: Centerville, 1-13-51, 3♀♀, 1♂ (DM, DFB, HEM)[7]; IV-18-51, 2♀♀ (DM); Hockessin, IV-18-51, 1♀ (DM); Pleasant Hill, Pike Creek, VII-12-58, 2 pup., 3 lar.; Milford Crossroads, Middle Run, VII-11-58, 11♀♀, 12♂♂, 55 pup., 46 lar.; VII-16-58, 1♀, 1♂, 1 pup., 28 lar.; Newark, E. Branch of Christiana Creek, VII-10-58, 271 lar.; White Clay Creek, VII-12-58, 8 lar.; N. Branch of Persimmon Run, VII-19-58, 5♀♀, 3♂♂, 9 pup., 28 lar.; Coochs Bridge, Christiana Creek, VII-13-58, 2 lar.; Glasgow, Muddy Run, VII-13-58, 28 lar.; Sunset Lake, VII-14-58, 2♀♀, 1♂, 10 pup., 20 lar.; Porter, Belltown Run, VII-19-58, 1 lar. (DS). SUSSEX COUNTY: Ellendale, VII-24-58, 3 lar. (DFB, MSC).

SURVEY OF THE WESTERN BRANCHES OF THE CHRISTIANA RIVER

From July 10 to July 19, 1958, a survey of the western branches of the Christiana River Basin in northwestern New Castle County, Delaware, was conducted. A total of 21 stations in 12 separate tributaries was selected for their diversity as blackfly habitats. It should be explained here that the term habitat is used in the broadest sense, i.e. to include not only the stream characteristics but the surrounding terrain. Within the station, samples were taken at several places in order to make the collections as comprehensive as possible. This included sections of the stream above and below as well as at the point where the current was the swiftest. A representative sample of other insect life was also collected and identified to family. No attempt was made to catch adult blackflies at these stations.

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[6] All identifications of *S. verecundum* were made or confirmed by Dr. Alan Stone.

[7] Collected as larvae and reared to adults in the laboratory.

Some material was preserved in 70 percent alcohol as it was collected. Mature larvae and pupae were returned to the laboratory in jars of habitat water, still clinging to rocks, plants or debris, for reared association studies.

REARING TECHNIQUE

The field collected pupae were reared essentially as outlined by Stone and Jamnback (1955). For a more detailed discussion of rearing methods, the reader is referred to Fredeen (1959). Specimens were placed on a piece of moist blotting paper which in turn was inserted into a special emergence test tube. The tube was 5½ × 1 inch with a side hole bored one inch from the bottom. This hole was stoppered with a cork and the top opening plugged with cotton. Whenever possible, the pupae were allowed to remain attached to the original material. These rearing tubes were held horizontally in a room at a constant temperature of 80° F and a relative humidity of 70 percent. They were kept in 12 hours of artificial fluorescent light and 12 hours of darkness daily. The darker, older pupae were used when possible, and emergence occurred in from one to three days.

The mature larvae were placed in habitat water in gallon battery jars equipped with aquarium aerators. The jars were covered with a single layer of cheese cloth to retain emerged adults. Air was moved over the jars with a large electric fan to promote cooling of the water by evaporation. The larvae congregated in the stream of air bubbles, generally within two inches of the water surface. A pinch of yeast was added to each jar, but no attempt was made to determine if it was utilized by the larvae. Pupation occurred in one to 10 days. These laboratory reared pupae were treated the same as the field collected ones. All adults were allowed to harden for at least 12 hours before preservation. Reared material was finally fixed in 70 percent alcohol.

FINDINGS

A summary of the blackfly species, an enumeration of the number of stations at which each species was collected, and the numbers of field preserved and laboratory reared specimens will be found in Table 1. In all, 1164 larvae, pupae and adults were collected and

TABLE 1. **Summary of blackflies collected in some western branches of the Christiana River, New Castle Co., Delaware, 1958**

Species	No. of Stations Present at	Field Preserved		Laboratory Reared		
		No. of Larvae	No. of Pupae	Females	Males	Pupae*
Simulium vittatum	10	435	35	19	17	25
Simulium venustum complex	9	170	45	26	1	32
Simulium tuberosum	7	149	1		3	
Simulium aureum	5	53	3	5	2	
Simulium verecundum	2				16	
Simulium decorum	2	119	7			
Simulium jenningsi	1				1	

* Includes both pupae which failed to emerge and empty exuviae brought to laboratory with live material.

identified. Of these, 1017 were field collected and preserved, while 147 were reared in the laboratory. The 57 pupae in the latter group included those which failed to emerge and the identifiable, emerged pupal exuviae brought to the laboratory with the live material. Stone and Jamnback (loc. cit.) and Jamnback (1956) were used in determining the blackfly species.

Seven Simuliid species, all belonging to the genus *Simulium,* were recovered from the Christiana River Basin. Distinguishing the members of the *S. venustum* complex was accomplished only through the aid of Dr. Stone (see footnotes 4 and 5). According to Stone and Jamnback (loc. cit.) the females and pupae of the three species composing this complex are indistinguishable. Only the larvae of *S. tuberosum* are distinct, thus the 170 larvae found to be in this complex are either *S. venustum* or *S. verecundum.* The males appear distinctive in all three species. It is interesting to note that none of the 150 specimens checked by Stone was found to belong to *S. venustum* (s. str.).

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BULLETIN
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Vol. LV JUNE, 1960 No. 3

A REPORT ON THE BLACKFLIES (SIMULIIDAE) OF DELAWARE.

PART II. DESCRIPTION AND DISCUSSION OF BLACKFLY HABITATS.

By Douglas W. S. Sutherland and Richard F. Darsie, Jr.

This is a continuation of a report on an investigation of the Simuliidae of Delaware (Bul. Brooklyn Ent. Soc., Vol. 55, No. 2). A detailed record of the species found in Delaware and an introduction to an intensive survey of certain branches of the Christiana River have been discussed in Part I; also see Fig. 1 for map. To pursue the latter further, particulars of the blackfly collecting locations are delineated in the ensuing account.

Description of Blackfly Habitats

Of the 21 stations originally inspected ,14 were positive for blackflies. A detailed description of each positive station, along with a list of other insects[1] observed, follows. These lists are undoubtedly incomplete, as exhaustive collecting of other forms was not attempted.

Station 1. Milford Crossroads, Middle Run, July 11, 1958; a small stream 3 to 8 feet wide and 3 inches to 3 feet deep, cool, clear water with sand, gravel and stone bottom; stream bordered by woodland and pasture; blackfly immatures attached to rocks, leaves, twigs, branches, cans, plastic curtain, and a wagon wheel; *S. vittatum* and *S. venustum* complex taken in three collections; other insects:

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[1] The immature insects were determined to order and family by use of Chu, H. F. 1949. How to know the immature insects. Dubuque, Iowa, W. C. Brown Co., 234 pp.

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Order	*Family*	*Stage*
Ephemeroptera	Ecdyuriidae	5 naiads
	Ephemerellidae	1 naiad
Trichoptera	Hydropsychidae	5 larvae
	Philopotamidae	2 larvae
	Rhyacophilidae	1 larva
Odonata		eggs common
Hemiptera	Veliidae	adults common
	Gerridae	adults common
Coleoptera	Gyrillidae	1 adult
	Psephenidae	1 larva
Diptera	Culicidae	*Anopheles* spp.
	Chironomidae	13 larvae
		6 pupal exuviae

Station 2. (Fig. 2.) Newark, E. Branch of Christiana Creek, July 10, 1958; medium-sized stream 10 to 25 feet wide and 3 inches to 4 feet deep, cool, clear water; sand, gravel and stone bottom, also large rocks; stream bordered by woodland, lawn and pasture; blackfly immatures attached to twigs and branches; *S. tuberosum, S. venustum* complex and *S. vittatum* taken in 12 collections; other insects:

Order	*Family*	*Stage*
Ephemeroptera	Baetidae	4 naiads
Trichoptera	Hydropsychidae	6 larvae
	Philopotamidae	2 larvae
	Rhyacophilidae	3 larvae
Odonata	Libellulidae	1 naiad
Hemiptera	Veliidae	adults common
	Gerridae	adults common
Diptera	Chironomidae	49 larvae
		15 pupal exuviae
	Dolichopodidae	1 larva, 3 pupae

Station 3. (Fig. 3.) Pleasant Hill, Pike Creek, July 12, 1958; small stream 4 to 6 feet wide and 3 inches to 3 feet deep, cool, clear water with gravel, stone and rock bottom; stream bordered by roadside, pasture, woodland, brush and weeds; blackfly immatures attached to rocks, sticks and grass; *S. decorum, S. tuberosum, S.*

venustum complex and *S. vittatum* taken in 2 collections; other insects:

Order	*Family*	*Stage*
Ephemeroptera	Ecdyuriidae	2 naiads
	Ephemerellidae	2 naiads
Trichoptera	Hydropsychidae	10 larvae
	Philopotamidae	1 larva
	Rhyacophilidae	1 larva
Diptera	Chironomidae	8 larvae

Station 4. (Fig. 4.) Glasgow, Muddy Run, July 13, 1958; small stream 8 to 10 feet wide and 3 inches to 3 feet deep, water muddy from recent rain, sand and rock bottom; stream bordered by woodland and meadow; blackfly immatures attached to leaves, logs, aquatic vegetation; *S. aureum, S. jenningsi, S. tuberosum, S. venustum* complex, *S. verecundum,* and *S. vittatum* taken in 3 collections; other insects: Odonata—eggs common; Diptera—Chironomidae, 19 larvae and 17 pupal exuviae.

Station 6. Coochs Bridge, Christiana Creek, July 13, 1958; river 20 to 30 feet wide and 6 inches to unknown depth in middle, water muddy from recent rain, coarse gravel, stone and rock bottom; stream bordered by picnic area and pasture; blackfly immatures attached to rocks; *S. vittatum* taken in 1 collection; other insects: Trichoptera, Hydropsychidae—1 larva; Diptera, Culicidae—*Anopheles* spp.

Station 8. (Fig. 5.) Newark, N. Branch of Persimmon Run, July 19, 1958; medium-sized stream 12 to 20 feet wide and 3 inches to 3 feet deep, cool, clear water, sand, gravel, stone and rock bottom; stream bordered by woodland; blackfly immatures attached to rocks; *S. tuberosum, S. venustum* complex and *S. vittatum* taken in 2 collections; other insects:

Order	*Family*	*Stage*
Ephemeroptera	Ecdyuriidae	2 naiads
Trichoptera	Hydropsychidae	5 larvae
Odonata	Aeschnidae	1 naiad
Hemiptera	Gerridae	adults common
Diptera	Chironomidae	1 larva

Station 12. Newark, White Clay Creek, July 12, 1958; river 50 feet wide and 6 inches to unknown depth in middle, clear water; sand, gravel, stone and rock bottom; stream bordered by pasture,

brush, factory and power plant; blackfly immatures attached to rocks and plywood; *S. vittatum* taken in 2 collections; other insects:

Order	*Family*	*Stage*
Ephemeroptera	Baetidae	3 naiads
	Siphonuridae	3 naiads
Trichoptera	Hydropsychidae	1 larva
Neuroptera	Sialidae	1 larva
Coleoptera	Dytiscidae	1 larva
Diptera	Chironomidae	6 larvae
	Dolichopodidae	3 pupae

Station 15. Glasgow, Muddy Run, July 14, 1958; a rill 1 to 2 feet wide and 3 to 6 inches deep with clear, cool water; gravel and rock bottom; run bordered by woodland, rye and pasture; blackfly immatures attached to rocks; *S. aureum, S. tuberosum* and *S. venustum* complex taken in 2 collections; other insects:

Order	*Family*	*Stage*
Trichoptera	Hydropsychidae	4 larvae
Odonata		eggs on leaf
Coleoptera	Dytiscidae	3 adults
Diptera	Chironomidae	2 larvae

Station 16. (Fig. 6.) Glasgow, Zeitler Dam, July 14, 1958; collection site was a board leaning against the dam breast, on which a trickle of water ran; dam bordered by pasture and brush; blackfly immatures attached to board; *S. decorum* taken in 1 collection; other insects: Diptera, Chironomidae—7 larvae.

Station 17. Glasgow, near Sunset Lake, July 14, 1958; rill 1 to 2 feet wide and 6 inches to 1 foot deep, cool, clear water, light gravel and silt bottom; run bordered by pasture; blackfly immatures attached to bark, leaves, trailing grass and aquatic vegetation; *S. aureum* and *S. vittatum* taken in 2 collections; other insects: Diptera, Chironomidae—3 larvae and 2 pupal exuviae.

Station 18. Milford Crossroads, Branch of Middle Run, July 16, 1958; small stream 4 to 6 feet wide and 2 inches to 3 feet deep; gravel and rock bottom; stream bordered by woodland; blackfly immatures attached to leaves and rocks; *S. tuberosum* taken in 2 collections; other insects: Trichoptera, Philopotamidae—6 larvae; Coleoptera, Psephenidae—3 larvae; Diptera, Chironomidae—9 larvae.

Station 19. Milford Crossroads, Branch of Middle Run, July 16, 1958; small stream 6 to 10 feet wide and 4 inches to 3 feet deep, warm, murky, slow-moving water; sand, gravel, stone and rock bottom; stream bordered by pasture and brush; blackfly immatures attached to leaves and rocks; *S. venustum* complex and *S. vittatum* taken in 2 collections; other insects: Trichoptera, Philopotamidae—1 larva; Diptera, Chironomidae—29 larvae and 3 pupal exuviae.

Station 20. (Fig. 7.) Porter, Belltown Run, July 19, 1958; small stream 2 to 8 feet wide and 3 inches to 3 feet deep; cool, clear water, sand and stone bottom; stream bordered by overgrown pasture and woodland; blackfly immatures attached to trailing grass and aquatic vegetation; *S. aureum, S. venustum* complex, *S. verecundum and S. vittatum* taken in 4 collections; other insects: Trichoptera, Philopotamidae—1 larva; Hemiptera, Notonectidae —adults common; Diptera, Chironomidae—29 larvae and 3 pupal exuviae.

Station 21. Newark, S. Branch of Persimmon Run, July 19, 1958; small stream 3 to 10 feet wide and 2 inches to 1 foot deep, cool, murky water, gravel and rock bottom; stream bordered by overgrown pasture and woodland; blackfly immatures attached to rocks; *S. aureum, S. tuberosum* and *S. venustum* complex taken in one collection; other insects:

Order	*Family*	*Stage*
Ephemeroptera	Ecdyuriidae	2 naiads
Trichoptera	Hydropsychidae	1 larva 1 stone case
Odonata	Aeschnidae	1 naiad
Hemiptera	Gerridae	adults common

The largest number of Simuliid species was taken from Muddy Run, Glasgow on July 13, 1958. Six of the seven species collected during the survey, were identified from this one site. Also, the larvae and pupae were attached to the widest assortment of objects.

DISCUSSION

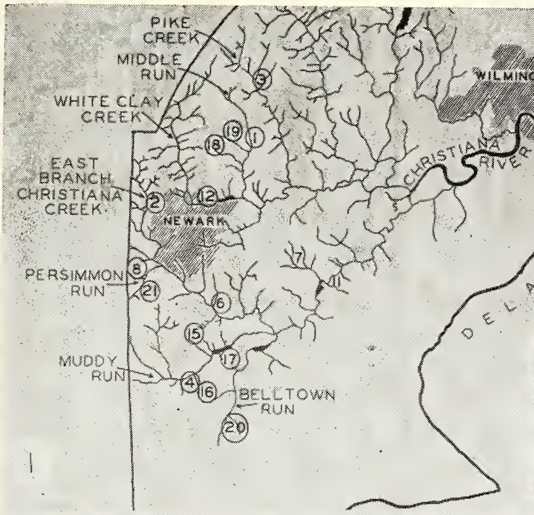
Blackfly habitats in Delaware appear to vary somewhat from those of other areas. In New York and Rhode Island, *S. vittatum* was found primarily in outlets of lakes, dams and swamps (Stone and Jamnback, 1955; Dimond and Hart, 1953) but it occurs in Canada and Alaska in rivers and larger streams as in Delaware (Twinn, 1936; Jenkins, 1948). The *S. venustum* complex seems to prefer small streams in most of its range; only Hocking and Richards (1952) report it from large rivers as well as small streams. O'Kane (1926) found *S. aureum*, listed as *S. bracteatum* Coq., in intermittent streams, which is similar to two of the three places, where it was taken in Delaware, and in Canada (Twinn, 1936). Stone and Jamnback (1955) and Jenkins (1948) recorded it from permanent waters. All are agreed that *S. decorum* breeds near the outlets of dams, lakes and pools, although one Delaware larva was collected from a small stream (Stone and Jamnback, 1955; Hocking and Richards, 1952; Jenkins, 1948).

The blackfly larvae appear to be non-selective as to the substrata used for attachment. Stones, live aquatic vegetation, dead leaves, twigs, branches and wood, and other debris are the five categories into which attachment sites in Delaware can be classed. Dimond and Hart (1953) found *S. vittatum* and *S. venustum* and Peterson (1959), *S. aureum* (as *Eusimulium aureum* Fries), more often on plant material. In our study, the former two species were attached to live vegetation and to dead leaves, each, about 19 percent of the total collections and the latter 55 percent of the total. Eggs and presumably larvae, of the same two blackflies were taken from plants, stones, logs, and other objects by Wu (1931).

The number of times two species were found in the same habitat is depicted in Table 2. Three species were taken in pure culture, but in most instances they occurred in association. *S. vittatum* and *S. aureum* with *S. venustum* complex was the combination most

EXPLANATION OF PLATE

Fig. 1, Northern New Castle County, Delaware, showing the western branches of the Christiana River and the location of the blackfly collecting stations. Those encircled were positive. Fig. 2, Station 2, East Branch of the Christiana River, near Newark, breeding place of *S. tuberosum, S. venustum,* and *S. Vittatum.* Fig. 3, Station 3, Pike Creek, near Pleasant Hill, breeding place of *S. decorum, S. tuberosum, S. venustum* and *S. vittatum.* Fig. 4, Station 4, Muddy Run, near Glasgow, breeding place of *S. aureum, S. jenningsi, S. tuberosum, S. venustum, S. verecundum* and *S. vittatum.* Fig. 5, Station 8, North Branch of Persimmon Run, near Newark, breeding place of *S. tuberosum, S. venustum,* and *S. vittatum.* Fig. 6, Station 16, Zeitler Dam, near Glasgow, breeding place of *S. decorum.* Fig. 7, Station 20, Belltown Run, near Porter, breeding place of *S. aureum, S. venustum, S. verecundum* and *S. vittatum.*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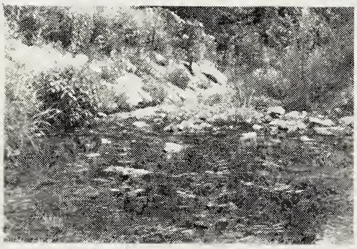

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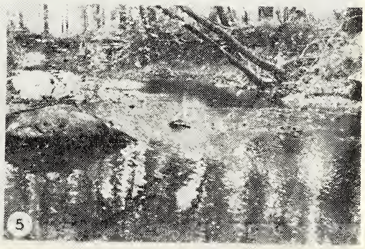

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TABLE 1. **Record of association of blackfly larvae and pupae in their Christiana River habitats, Delaware, 1958**

Species	*S. aureum*	*S. decorum*	*S. jenningsi*	*S. tuberosum*	*S. venustum*	*S. verecundum*	*S. vittatum*
S. aureum	X		1	3	4	2	3
S. decorum		1		1	1		1
S. jenningsi			X	1	1	1	1
S. tuberosum				1	6	1	4
S. venustum					X	2	7
S. verecundum						X	2
S. vittatum							2

frequently encountered. These are common incidents throughout their ranges (Wu, 1931; Jenkins, 1948; DeFoliart, 1951; Dimond and Hart, 1953). Whereas this multiple species relationship appears to be the rule in Delaware, Jenkins (1948), dealing with larger numbers, considered it the exception. He believed that they exhibited specificity to typical habitats.

The sampling of other arthropods from blackfly larval habitats was reported by Jamnback and Collins (1955). All of the insect orders recorded by us plus Plecoptera and Lepidoptera were collected by them. Actually the stoneflies were the most abundant non-Simuliid encountered in their study, while they were apparently absent from the Christiana River stations.

Hocking and Richards (1952) collected other insects, but from blackfly adult, rather than larval, habitats. There were, therefore, few coincidences with our collections. They indicated that *P. hirtipes* and *S. venustum* were the most important pests of man in Northern Canada, that *C. mutata* and *S. aureum* only rarely attacked man, and that *S. vittatum* was a doubtful pest species. DeFoliart (1951) and Stone and Jamnback (1955) are essentially in agreement. In addition, they do not consider *S. decorum* a pest.

The authors could speculate about which species of blackflies should have been, and probably will be, found in Delaware, but that might be confusing to the reader. Suffice it to say that we believe, on the basis of the distributional data given by McComb and Bickley (1959), Stone and Jamnback (1955), Nicholson and Mickel

(1950), Frost (1949), and Twinn (1936), that at least 17 species of Simuliidae will eventually be found in Delaware. Larval surveys in the spring and fall months will undoubtedly encounter some of these species.

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SOME BIRDS OF URUGUAY PARASITIZED BY ORNITHOCTONA ERYTHROCEPHALA (DIPTERA, HIPPOBOSCIDAE)

By Rodolfo Escalante[1]

In *The Hippoboscidae or Louse-Flies of Mammals and Birds* (Entomologica Americana, 1954 and 1956) Dr. Joseph C. Bequaert includes Uruguay within the range of *Ornithoctona erythrocephala* with records of only three specimens as follows: one specimen as a parasite on *Columba picazuro* from Laguna Mirim and two specimens on *Buteo magnirostris gularis* from Rocha and Montevideo.

In this article are considered some birds of Uruguay whose skins are in my personal collection and from which louse-flies were collected or observed by the author. The parasitized birds were obtained within an area of about 15,000 square kilometers in eastern Uruguay near the Brazilian boundary and on the Atlantic coast. There, highlands are scarce; a great number of large lagoons are surrounded by grassy lowlands and marshes. The climate is temperate and with high humidity.

In the following list of hosts and parasites, wherever the collector's name is omitted the specimen may be assumed to have been collected by the author. For scientific and common English names of birds, *Catalogue of Birds of the Americas and Adjacent Islands* by Hellmayr and Conover (Field Mus. Nat. Hist., Zool., XIII, Pt. 1, N. 4, 1949) was used.

Buteo magnirostris pucherani (= *B. m. gularis*), Pucheran's Large Billed Hawk. Gavilán Bobo.—On September 23, 1953, one adult female was procured in Coronilla (Departamento de Rocha, Km. 315, No. 9 Road). On this bird were found two specimens of *O. erythrocephala*. These flies were given by the author to Luis P. Barattini's Collection of Diptera (Montevideo) and were seen by Dr. J. C. Bequaert who has reported them in the reference cited above. His citation of Montevideo as the collection locality for one of the specimens is in error.

On September 24, 1953, one adult male bird was killed at Km. 195 of No. 13 Road near Cerro do los Potros (Departamento de Maldonado). In this instance another specimen of the louse-fly was taken. This parasite and the following one identified by the author were sent as a gift to the U. S. National Museum (Smithsonian Institution) where the identification was checked by Dr. Stone.

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On February 9, 1954, one young female was shot on the eastern slope of Punta Ballena (Departamento de Maldonado). Another fly was caught on this bird.

All of the birds were skinned immediately after death and the parasites were seen on base of thighs, uropygium, rump and anal region. They moved swiftly among the feathers finally assuming a position with the dorsal surface against the skin of the bird and grasping very strongly the shafts and barbs of the feathers with their limbs.

Buteo fuscescens fuscescens (= *B. melanoleucus melanoleucus*), Buzzard Eagle. Aguila Gris.—On August 14, 1954, Roberto Peñagaricano sent me an adult male bird from Sierra de Otazo (Departamento de Treinta y Tres). When I opened the shipping box I found a specimen of *O. erythrocephala* on the upper wing coverts.

Two other specimens of *O. erythrocephala* were collected by the author on a subadult male of this hawk collected by Mr. Peñagaricano in the same locality on April 15, 1955. These flies left the body of the host, flying in the room where I was working. Their flight was jerky, straight and quick. Both flies alighted on the curtain of a window grasping tenaceously to the cloth.

Otus choliba choliba, Choliba Screech Owl. Coruja o Lechucita. —On July 16, 1955 an adult female was shot in Pinares de Portezuelo, near Laguna del Sauce (Departamento de Maldonado, Km. 128, No. 9 Road). Having put this little owl near me in my car, I saw, after a time, on the external surface of the plumage of the owl's head a louse-fly with the conspicuous red eyes and dull greenish abdomen of *O. erythrocephala.* It flashed away at high speed through the window of my car.

Circus cyaneus cinereus, Cinereus Harrier. Gavilan Ceniciento. —Enrique Gomez Haedo sent me one juvenile male harrier on May 18, 1957, from marshes near Laguna Negra (Departamento de Rocha). From the surface of the bird's head I obtained another fly.

Remarks.—According to the facts mentioned above it seems that *Ornithoctona erythrocephala* can be considered to be endemic in Uruguay because it has been collected all the year round on native birds. Punta Ballena (Departamento de Maldonado) at 35 degrees south latitude is the southernmost locality recorded for the parasite on the eastern coast of South America.

I express my gratefulness to Dr. Alan Stone (U. S. National Museum) who has checked the identifications for me. I am also indebted to Dr. George S. Tulloch (Brooklyn Entomological Society) and Dr. Maurice T. James (State College of Washington) who courteously put me in touch with Dr. Stone.

THE APHIDS THAT FEED ON CACTI

By Mortimer D. Leonard, Washington, D. C.

In 1959, Dr. W. R. Enns of the Department of Entomology of the University of Missouri sent me some aphids he had collected in Henderson, Nebraska, on May 15, 1958, on an orchid cactus, *Epiphyllum* sp. Since this cactus is not listed in Patch's *Food Plant Catalog of Aphids of the World* and little is known about aphids on cacti, my interest was aroused to find out what aphids occur on this group of plants and under what circumstances.

There follows an analysis of what little literature there appears to be on this subject and such additional unpublished information as I have been able to obtain.

My thanks are due to Dr. F. G. Meyer of New Crops Research, Plant Industry Station, Beltsville, Maryland, for checking the validity of the names of the cacti mentioned in this paper.

Myzus persicae (Sulzer).—The aphids received from Dr. Enns proved to be the widespread and polyphagous green peach aphid, *Myzus persicae* Sulzer. He states that these came from a single specimen of *Epiphyllum* growing in his mother's old home and that none of several adjacent plants of other kinds had any aphids. The cactus had a considerable infestation on the buds and flowers.

In 1908, Gillette and Taylor published Colorado Agricultural Experiment Station Bulletin 133 entitled "A Few Orchard Plant Lice." In their discussion of *Myzus persicae* Sulzer, a list of plants is given on which this aphid had been found establishing colonies in the greenhouse, (presumably at Ft. Collins). One of the plants listed is *Opuntia* sp.

On April 10, 1960, Dr. L. L. Pechuman of Lockport, N. Y., collected *Myzus persicae* (Sulzer) on hybrids of an orchid cactus, *Epiphyllum* sp. in a greenhouse at Lyndonville, N. Y. He states that the aphids were only on two plants and that they were restricted to the opening buds on which they were abundant.

Forda myrmecaria Boisduval.—Boisduval (France) in his "Essai sur l'Entomologie Horticole" on page 278 (1867) states that a root aphid, probably *Forda myrmecaria* is found at the base of "cactus, *Fuchsia, Lantana, Cuphea,* etc." growing in greenhouse benches and in flower pots in the garden.

Aphis fabae Scopoli.—L. Macchiati (Italy) in "Fauna e Flora degli Aphidi di Calabria" on page 256, Boll. Soc. Ent. Italiana 15, 1883, states that *Aphis fabae* Scop. (as *A. papaveris* Fab.) is very common in the spring on *Opuntia vulgaris* Mill. as well as on certain other plants around Reggio.

Aphis rumicis L.—Wilson and Vickery in "A Species List of the Aphididae of the World and their Recorded Food Plants" (Wisc. Acad. Sci., Arts and Letters, Trans. XIX, pt. 1) list *Aphis rumicis* L. as occurring on *Opuntia ficus-indica* (L.) Mill. Since this aphid, as now defined, is considered to be confined only to species of *Rumex* it is suggested that the species here referred to could be *Aphis fabae* Scop. or maybe *A. medicaginis* Koch.

Aphis spiraecola Patch.—In 1929, Ralph L. Miller published University of Florida Agricultural Experiment Station Bulletin 203 entitled "A Contribution to the Biology and Control of the Green Citrus Aphis, *Aphis spiraecola* Patch." In this (p. 435) he states that in Florida this aphid has been reported from the lemon vine, *Pereskia aculeata* (Plum.) Mill. In order to further substantiate this mere statement, I wrote Dr. A. N. Tissot, Entomologist of the Agricultural Experiment Station at Gainesville, Florida. Under date of October 1, 1959, he replied as follows:

"It seems pretty certain that there are no slides of material collected by Ralph Miller. He did not send the material to me for identification or there would be slides of it in the collection here. Although Ralph was not much interested in the taxonomy of the aphids, he undoubtedly knew *spiraecola* well enough to make sight identifications of it. On the other hand it is also possible that his statement was based on collections by some other person. In the collection here there are five slides of *spiraecola* taken on *Pereskia aculeata* in Orlando by Erdman West on October 10, 1929. This collection probably was made after Ralph's bulletin was published. Also in the collection are three slides of specimens collected by R. J. Wilmot in Gainesville on December 4, 1934.

"Erdman West says that *Pereskia* is an introduced plant which is fairly common in southern Florida. In average winters it will survive out of doors as far north as Orlando but would be killed in Gainesville. That means that the Wilmot collection was made in the greenhouse though the slides do not so indicate. West and I clearly remember the plant on which the aphids probably were found. It over-ran one side of a greenhouse for several years.

"You asked if *spiraecola* is scarce or abundant on *Pereskia*. The fact that there are only two collections represented by slides and the one published record indicates that it is far from common. I have inquired at the State Plant Board and found that they have no records of *spiraecola* on *Pereskia*."

Aphis craccivora Koch.—Tissot continues in the above-mentioned letter: "You asked only about *spiraecola* but I am sure you will be interested in another aphid record from *Pereskia.* A couple of years ago Frank Robinson of this Department, who is interested in honey plants, put out some plants of *P. aculeata* at our test area. A frame and plastic shelter was provided for them and they survived last winter without much cold injury. The plants grew very rapidly this summer and it was necessary to prune them frequently to keep them in bounds. One day while pruning, our helper noticed a colony of aphids on a tender tip which he brought to me. At first glance I took it to be *Toxoptera aurantii* but they did not look quite right for that species so I made a few color notes before putting the specimens in alcohol. Being busy then and since, I practically forgot about the aphids until your letters came. Eventually, I found time to mount them for study. They proved to be *Aphis medicaginis* Koch following Palmer.[1] It was a bit surprising to find this aphid on *Pereskia* though it is a very general feeder of course. There are some black locust trees within 100 feet of the *Pereskia* plants and cowpeas were growing all about the place. The aphids were collected August 5, 1959 by J. M. Brown. He has pruned the plants several times before and since he found the aphids and has never seen another colony. This colony was a well-established one. I preserved 15 apterous adults and discarded nymphs. Mr. Brown was sure that there were no alates in the colony and I found no nymphs with wing pads."

Pentalonia nigronervosa Coquerel.—G. H. Hardy, in his paper "Aphididae in Australia" (Proc. Royal Soc. Queensland 43: 31, 1932) in noting the food plants of *Pentalonia nigronervosa* Coquerel makes the following statement: "*Opuntia inermis* (now *O. stricta* (Haw.) growing alongside bananas infested with the aphis, were alighted upon and colonies started on the buds and continued to thrive as long as the flowers flourished. As soon as the sapflow ceased, though the petioles had scarcely time to wither and fall, the colonies died. Apparently they can thrive on the pear only on the flower heads."

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[1] In April 1960 Miss Louise Russell, Entomology Research Division, ARS, USDA, examined slides of this aphid submitted to her by Dr. Tissot and found that the specimens are *Aphis craccivora* Koch which has been shown to be a rather general feeder in Europe. It has been misidentified in American collections of *A. medicaginis* Koch which is now considered to be confined only to the Leguminosae.

A NEW SUBGENUS AND TWO NEW SPECIES OF PSEUDIASTATA COQUILLETT (DIPTERA, DROSOPHILIDAE)

By Marshall R. Wheeler[1]

The genus *Pseudiastata,* described by Coquillett (1908), contains five described species from the United States, Central and South America. As far as is known, they are all predators on pineapple mealybugs. Their general biology and distribution have been most recently discussed by Sabrosky (1951) and Hardy (1959). These five species constitute the nominate subgenus, the type species of the genus (*P. nebulosa* Coquillett) also being the type of the subgenus *Pseudiastata.*

Members of the new subgenus described below show many similarities to the nominate subgenus. In both the arista is micropubescent, the face is narrow and rather flat, and the palpi are small. The postvertical bristles are only moderately well-developed, while the ocellar bristles are quite small and proclinate to mildly cruciate. The three orbital bristles are large and strong and are conspicuous on the narrowed front (Figs. 1, 2). The eyes are large and bare, the cheeks being correspondingly narrow. The posterior dorsocentral bristles are not in line with the anterior ones, but are clearly moved laterad, simulating the condition seen in many genera of Ephydridae. The prescutellar and sutural bristles are strong, while a propleural bristle is absent. The costal index is high, typically 4.0 or higher.

Pseudiastata, **Hyalistata,** n. subg.

The type species of this new subgenus is *Pseudiastata* (*Hyalistata*) *pictiventris* Wheeler, described below. The name *Hyalistata* was coined to suggest a hyaline-winged *Pseudiastata*-like group, and is feminine.

In this subgenus the wings are entirely hyaline, lacking the complex patterns characteristic of the typical subgenus, and the costal index is higher (6.0 or more). The pubescence of the arista is thicker and longer. The middle femur has a row of stout black bristles along its outer edge. The front is narrower and more sparsely haired, and the anterior orbital bristles are truly proclinate and are located nearer the middle of the front (Fig. 2); in the subgenus *Pseudiastata* they are located just behind the lunule and are nearly cruciate (Fig. 1). The abdomen shows some degree of a darker pattern, while in members of the subgenus *Pseudiastata* it is wholly pale.

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Little is known of the biology of the species of *Hyalistata*. The Trinidad specimens bear labels reading "associated with Psyllid on Guava leaf," and one of the Florida specimens is labelled "at *Avicennia nitida*" (the Black Mangrove) and may prove to be associated with some homopterous insect pest of this plant.

Pseudiastata (Hyalistata) pictiventris, n. sp.

♂, ♀. Front twice as long as wide, light brown but paler on the orbits and blackish in ocellar area. Frontal bristles as shown in Fig. 2; ocellars small, aligned with anterior ocellus; the two reclinate orbitals of nearly equal length but posterior one stouter; proclinate orbital ¾ length anterior reclinate, the distance between their bases about ⅓ that between the two reclinates. Antennae tan, third segment rather large. Face as narrow as front, pale; vibrissa single, strong; cheeks, palpi and clypeus all pale.

Mesonotum tan, more yellowish behind and on scutellum; acrostichal hairs numerous. Pleura and legs yellowish tan; halteres pale. Wings hyaline, the veins dark. Costal index about 6.0; 4th vein index about 1.3.

Abdominal pattern somewhat *Leucophenga*-like; that of the female allotype is shown in Fig. 3. The 6th segment is probably all dark but it is telescoped rather far beneath the 5th. The abdominal pattern of the holotype male is obscured due to internal discoloration, but it appears to lack the black areas of segment 3 and those of the 4th and 5th segments are smaller than on the female. The 6th is pale above, dark on the sides; the anal plates are yellow.

Body length (♀) about 3.0 mm., wing, 3.0 mm.

Holotype male, U. S. National Museum collection, labelled: "Cuernavaca, Mor. Mexico, IV.1945"; "N. L. Krauss." *Allotype* female, Canadian National Collection, labelled: "Homestead, Fla., 4-IV-1952; G. S. Walley." A second male (USNM) from Everglades National Park, Dade Co., Fla., H. A. Denmark, 12 III 1955, "at *Avicennia nitida*", may also represent this species, but the abdomen appears to be wholly black except for a pair of pale lines on the 5th segment, one on each side of the midline.

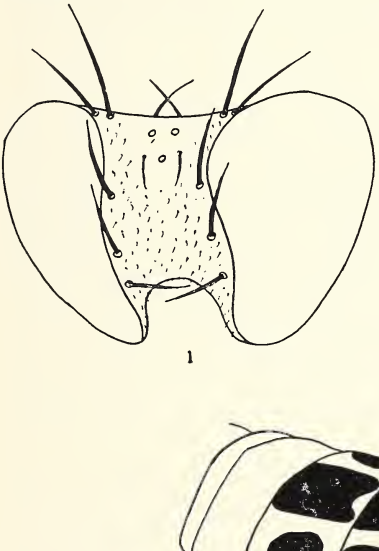
Pseudiastata (Hyalistata) pallida, n. sp.

♂. Similar to *pictiventris* but smaller and paler. Mesonotum light tan, including pleura and scutellum. Front narrow, tan, darkened in ocellar area. Cheeks very narrow. Antennae, face, cheeks, proboscis and palpi yellow. Legs wholly yellow. Wings hyaline, the veins pale except for the costa. Costal index 7.0 or a little higher; 4th vein index about 1.3.

Abdomen yellowish with a few poorly-defined brownish marks. One specimen shows three such areas on the 4th segment, an elongate median one and a sublateral spot on each side basally; the 5th segment has a weak median spot basally, and a larger, more distinct brown area at extreme lateral margin. On the second specimen no markings are visible on the 4th segment, but the 5th has the marks described above.

Body length 2.2 mm; wing, 2.2 mm.

Holotype male and *paratype* male, U. S. National Museum collection, labelled: "associated with Psyllid on Guava leaf"; "St. Augustine, Trinidad, B.W.I., March 17, 1954"; "collector F. D. Bennett."



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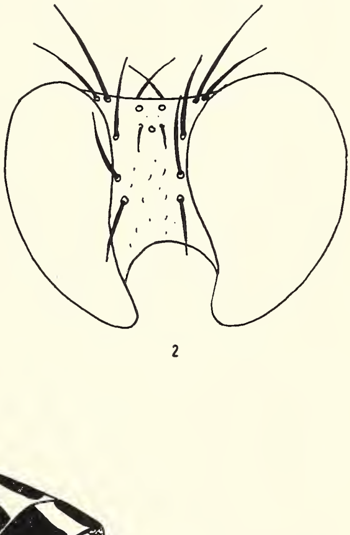

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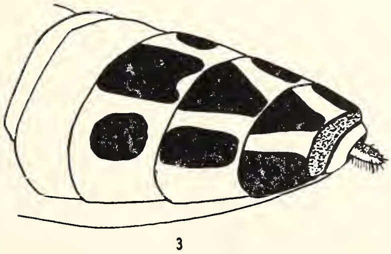

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Fig. 1, *Pseudiastata* (*P.*) *pseudococcivora* Sabrosky, frontal bristles. Fig. 2, *Pseudiastata* (*H.*) *pictiventris* n. sp., frontal bristles. Fig. 3, *Pseudiastata* (*H.*) *pictiventris* n. sp., abdominal pattern of allotype female, dorso-lateral view.

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NOTES ON BUPRESTIDAE AND SCHIZOPODIDAE

By G. H. Nelson[1]

Buprestidae

Because the spring and summer reasons of 1959 were abnormally dry in Southern California, the general scarcity of some of the species of Buprestidae was expected. However, several species that are usually only rarely taken occurred in some numbers. Notes on the habits of these and other Buprestidae including new host records for some species previously recorded, Nelson, 1959, Bul. Brooklyn Ent. Soc. 54(1): 21–24, are presented here. Thanks are due Messrs. D. S. Verity, G. C. Walters, R. L. Westcott and Dr. R. L. Schultz for allowing the writer to make their collections known.

Acmaeodera pullata Cazier, 1940, Wasmann Collector 4(2): 57, 58.—One specimen was beaten from *Quercus dumosa* Nutt. at Pinyon Flats, Riverside Co., Calif., May 30, 1959, by R. L. Westcott and two were taken from *Ceanothus sp.* at Boulevard, San Diego Co., Calif., June 26, 1959, by D. S. Verity.

Acmaeodera aurora Fall, 1922, Bul. Brooklyn Ent. Soc. 17: 88.—Eight specimens of this colorful species were taken by R. L. Westcott during 1959 at Mountain Springs, Imperial Co., Calif., four on June 28 and four on July 4. Three from the former date were

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taken from *Acacia greggii* Gray flowers while all other specimens were taken from *Juniperus sp.* One specimen was collected at Mountain Springs by D. S. Verity on *Eriogonum fasciculatum* Benth.

Acmaeodera fisheri vermiculata Knull, 1947, Ohio Jour. Sci. 47: 174.—This was taken in good series in Riverside Co., Calif., in the following places during 1959: 2.5 mi. S. Palm Desert, June 18 and 23; Palm Desert, June 25; North Palm Springs, June 21 and 23. All were taken from the blossoms and stems of *Eriogonum inflatum* Torr. & Frem. D. S. Verity took a series of 25 of this subspecies from dead twigs of *Hyptis emoryi* Torr. near Palm Desert and two specimens at Mountain Springs, San Diego Co., Calif., June 7, 1959, on *E. inflatum.*

Acmaeodera palmarum Timberlake, 1939, Pan-Pac. Ent. 15: 181. —A few of this species were collected 4 mi. E. of Big Pine, Inyo Co., Calif., May 25 and 26, 1959, and good series were taken in Riverside Co., Calif., at the following places and dates during 1959 by R. L. Schultz, G. C. Walters and the writer: 2.5 mi. S. of Palm Desert, June 18 to 25; 5 mi. N. of Palm Springs, June 21; North Palm Springs, June 21 and 23. The darker elytral markings are more pronounced on some of the specimens from Inyo Co. and one has the darker markings predominant. The males range from 3.4 to 5.0 mm. in length, the females from 3.6 to 5.5 mm. All of the above were taken from the blossoms of *Eriogonum inflatum* Torr. & Frem. D. S. Verity has taken four of this species from dead twigs of *Hyptis emoryi* Torr. near Palm Desert, Calif.

Acmaeoderoides insignis (Horn), 1894, Proc. Cal. Acad. Sci., ser. 2, 4: 377.—Many of this interesting little species were collected on *Eriogonum inflatum* Torr. & Frem. in Riverside Co., Calif., during 1959 at the following places and dates: 2.5 mi. S. of Palm Desert, June 16 and 18; 5 mi. N. of Palm Springs, June 21; North Palm Springs, June 21 and 23. The dark elytral markings vary from being confined to the suture and lateral margins to forming irregular transverse fasciae across the posterior two thirds. The males and females both range in length from 3.5 to 5.0 mm.

Hippomelas (*Nanularia*) *brunneata* Knull, 1947, Ent. News 58: 210.—This rather widespread species was collected on the stems of *Eriogonum inflatum* Torr. & Frem. in small numbers during 1959 in Riverside Co., Calif. at the following places: 2.5 mi. S. of Palm Desert, June 18; 3 mi. S. of Palm Desert, June 25; Palm Desert, June 30; North Palm Springs, June 21 and 23. D. S. Verity took two specimens at Jacumba, San Diego Co., Calif.

Juniperella mirabilis Knull, 1947, Ohio Jour. Sci. 47(2): 69, 70. —One of the highlights of the 1959 collecting season was the finding of this strikingly beautiful species. Repeated trips to the type locality, at 4000 feet in the pass between the San Jacinto and Santa Rosa Mountains, turned up no specimens. However, on July 9, while beating *Juniperus californica* Carr. in the Mojave Desert at Desert Springs, San Bernardino Co., Calif., a female specimen flew with a sound similar to a diesel truck revving its engine (a similarity that led to several "false starts" later on). After a circuitous flight it was netted on the same tree from which it had flown. A fresh emergence hole was found in the trunk about 12 inches from the ground. Several trips to the same general area netted a short series of both sexes. The best method for capturing them seemed to be by carefully examining the foliage of the juniper trees and when a beetle was sighted clamping two hands around it. The beetles flew actively and on becoming disturbed would sometimes fly completely out of sight. Males were more scarce than females. Two specimens have the middle two of the four transverse yellow elytral fasciae united longitudinally. Otherwise, with only slight variation, the specimens are like the color pattern of the type as illustrated by Prof. J. N. Knull. Externally the males and females are much alike. However, while the antennae of the females fail to reach the posterior angles of the pronotum, those of the males slightly exceed the angles. The type is evidently a female, judging from the generic description of the antennae. In the series at hand the males vary from 16.0 to 18.5 mm. in length and from 6.5 to 8.2 mm. in width while the females vary from 16.0 to 20.5 mm. in length and from 6.5 to 10.0 mm. in width. Specimens were taken between July 9 and August 16, 1959, by R. L. Westcott, R. L. Schultz, G. C. Walters and the writer.

Chrysobothris azurea LeConte, 1857, Acad. Nat. Sci. Phila. Proc. [9]: 8; 1859, Amer. Phil. Soc. Trans. (n. s.) 11: 239.—A short series was taken near Whitmore Lake, Livingston Co., Mich., between June 14 and July 7, 1956, by beating the dead limbs of *Populus tremuloides* Michx. both at night and during the day.

Chrysobothris concinnula LeConte, 1859, Amer. Phil. Soc. Trans. (n.s.) 11: 238, 239.—One male of this species was taken by beating *Quercus alba* L. 2 mi. N. of Whitmore Lake, Livingston Co., Mich., July 14, 1956.

Chrysobothris piuta Wickham, 1903, Canad. Ent. 35: 67–69.—One male was taken by the writer while beating *Ceanothus divaricatus* Nutt., June 8, 1958, 14 mi. N.E. of Redlands, Calif. Other Calif. records by Verity & Westcott include: San Jacinto Mts., July 5, 1958, from *Cercocarpus sp.;* Boulevard, San Diego Co., June 7 and 27, 1959, from *Cercocarpus sp.* and *Ceanothus sp.;* Banner, San Diego Co., June 17, 1958, from *Ceanothus sp.;* San Gabriel Mts., July 18, 1959, from *Cercocarpus sp.*

Chrysobothris parapiuta Knull, 1938, Ann. Ent. Soc. Amer. 31: 138.—One male was taken at Scissors Crossing, E. of Julian, San Diego Co., Calif., June 7, 1959, while beating dead branches of *Acacia greggii* Gray.

Chrysobothris lineatipennis Van Dyke, 1916, Ent. News 27: 411. —One of this rare species was taken by D. S. Verity on June 4 and one by R. L. Westcott on July 7, both on *Eriogonum fasciculatum* Benth. in the Santa Montica Mts. near Los Angeles. A male and female were collected by the writer on the woody stems of *E. fasciculatum* 3 mi. E. of Mentone, San Bernardino Co., Calif., May 9, 1959.

Chrysobothris Wickhami Fisher, 1942, Misc. Publ. U.S.D.A. No. 470: 209, 210.—The following are collecting records for this species from Southern Calif. by Verity, Westcott and the writer: 4 mi. E. of Plaster City, Imperial Co., June 15, 1957; 8 mi. E. of Holtville, Imperial Co., May 30 and June 24, 1958; July 4, 1959; 13 mi. S.W. of Ripley, Riverside Co., June 29, 1957. All were on *Prosopis chilensis* (Molina) except for the Riverside Co. record, which was on *P. pubescens* Benth.

Chrysobothris cupreohumeralis Van Dyke, 1934, Ent. News 45: 65, 66.—Two specimens of this uncommon species are in the writer's collection from Sahuarita, Ariz., April 11, 1947, collected by H. and M. Townes. D. S. Verity collected two specimens in Calif., one on *Acacia greggii* Gray from the Santa Rosa Mts., 2000 feet elev., Riverside Co., June 1, 1959, and the other was found dead in a spider's web at Mountain Springs, Imperial Co., July 4, 1959.

Chrysobothris biramosa callida Knull, 1958, Ohio Jour. Sci. 58 (2): 96.—This species was previously erroneously listed as *C. atrifasciata* LeConte, Nelson, 1959, Bul. Brooklyn Ent. Soc. 54 (1): 21–24. Thanks are due Prof. J. N. Knull for drawing attention to this error. *C. atrifasciata* evidently hasn't been taken in California and can easily be separated from *C. biramosa callida* by the ventral coloration, bronzy-green in the former, bronzy-brown in the latter. Another short series of *C. biramosa callida* was taken during 1959, one specimen at Palm Springs, Calif., June 16 on *Atriplex canescens* (Pursh) and several from 1 mi. N. of Mecca, Riverside Co., Calif., June 25 on *Atriplex lentiformis* (Torr.). The males were generally captured from near the distal end of one of the peripheral branches while the females were usually deep within the shrub.

Chrysobothris platti Cazier, 1938, Bul. So. Calif. Acad. Sci. 37: 14, 15.—One of three females taken at Desert Springs, San Bernardino Co., Calif., July 29, 1959, exhibits a faint pattern of blue on the green elytra similar to *C. ulkei* LeConte.

Chrysobothris santarosae Knull, 1947, Ohio Jour. Sci. 47: 70.—More specimens of this species were taken during 1959. D. S. Verity, and R. L. Westcott collected about 20 specimens near Jacumba, San Diego Co., Calif., June 27 and 28, on *Ephedra sp.* R. L. Schultz, G. C. Walters and the writer took it at Desert Springs, San Bernardino Co., July 26 and August 2, 1959 on *Ephedra californica* Wats. All of the specimens of this species that have been taken, as far as the writer knows, have been males and these on the same *Ephedra* bushes where female *C. platti* Cazier were taken. Further information may show *santarosae* to be a color variety of *platti.*

Agrilus arbuti Fisher, 1928, U.S.N.M. Bul. 145: 50–53.—Records of this species from Southern Calif., all on *Arctostaphylos sp.,* include: San Bernardino Mts., 5000 feet elevation, 3 mi. S. of Camp Angelus, June 6 to 20, 1958; 4500 feet elevation, June 28, 1958.

SCHIZOPODIDAE

Dystaxia murrayi cuprea Knull, 1947, Ohio Jour. Sci. 47: 72.—The description was made from a single female collected at Cajon Pass, San Bernardino Co., Calif., June 26, 1941. It was originally considered to be a subspecies of *D. m. murrayi* LeConte. However, both forms were collected equally common on the same trees by Verity, Westcott, Walters and the writer at the following places and dates, all during 1959: The Oaks, Mint Canyon, Los Angeles Co., July 12–August 2; Soledad Canyon, Los Angeles Co., July 14; 3 mi. W. of Acton Junction, Los Angeles Co., August 2. All specimens, except several at the latter place which were taken on *Juniperus sp.,* were collected by beating *Quercus agrifolia* Née. and *Q. dumosa* Nutt. The morphological characteristics of the two forms appear to be alike including male genitalia, so *D. murrayi cuprea* Knull is probably but a color variety of *D. m. murrayi* LeConte.

BIOLOGICAL NOTES ON SEVERAL SOUTHWESTERN GROUND-NESTING WASPS (HYMENOPTERA, SPHECIDAE)

By Karl V. Krombein*

In 1959 I had an opportunity to spend July 17 to 31 in residence at the Southwestern Research Station, American Museum of Natural History, near Portal, Arizona.[1] I spent the first week gathering a large number of nests constructed by solitary wasps and bees in borings in wooden traps and recording details of the biology and nest architecture; this study will be reported in another contribution. During the second week I made biological notes on some ground-nesting wasps, and collected wasps and bees, principally on flowers of *Euphorbia albomarginata*.

This paper presents the studies on ground-nesting wasps. All the observations were made on the desert floor, at about 4000 feet elevation, along the roadside about 3 miles east of Portal.[2]

Tachytes exornatus Fox

On July 26 I caught a worn female (72659 B) 19 mm. long at 3:15 p.m. She was flying with a paralyzed acridid nymph 12.5 mm. long of a species of *Conalcea* (?).

Cerceris bicornuta fidelis Viereck and Cockerell

At 3:10 p.m. on July 24 a female of this species (72459 A) flew to her burrow entrance several centimeters from the edge of the road. She dropped a bulky weevil at the entrance, went inside, and a few seconds later reached out and pulled in the weevil. She had not emerged when I left 5 minutes later. When I returned at 3:38, she flew out toward the southwest after hesitating a few seconds at the entrance. Seven minutes later she flew back with another bulky weevil, apparently of the same species. This time I netted the wasp with her prey, releasing the former after ascertaining her identity. The weevil was a species of *Eupagoderes* 12 mm. long. It occurred

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[1] This work was supported by a grant in aid from the American Philosophical Society. I am indebted to Director Mont Cazier for placing at my disposal the excellent facilities of the Station.

[2] Identifications of Curculionidae were made by R. E. Warner, of Miltogrammini by W. L. Downes, Jr., and of Orthoptera by A. B. Gurney.

rather commonly on foliage of snakeweed (*Gutierrezia* sp.). At 5:30 this weevil could make weak reflex movements of its tarsi, mouth parts and antennae, and had voided some excrement.

Four additional provisioning flights on July 26 and 27 required from 6 to 10 minutes from the time the wasp left the burrow until she returned with a weevil. She made two flights directly into the burrow with the weevil, but on the other flights she dropped the weevil at or near the entrance, entered the burrow, and reached out a few seconds later to pull in the weevil. On one of the return flights the wasp was trailed by two miltogrammine flies which perched on some vegetation near the burrow entrance. I captured one of these, a female of *Senotainia kansensis* Tns. (?).

The wasp constructed a closing plug of earth about 20 mm. below ground level during the afternoon of July 27. I tried unsuccessfully to dig up the cells on the 29th. About 25 mm. below the surface the burrow, which was about 15 mm. in diameter, turned at right angles toward the west and continued downward for 100 mm. at an angle of 45°. Then it turned toward the southwest at an angle of 75° for 50 mm., toward the south horizontally for 50 mm., downward for 125 mm. at an angle of 30°, and slightly eastward for 110 mm. at an angle of 30°. About half way down this last section a subsidiary burrow branched off toward the west at an angle of 75°; it ended at a depth of 56 cm. and there was no cell. The main burrow continued straight downward for 265 mm., then at an angle of 45° to the south for at least 150 mm.; and then toward the southeast at about 30° for 75 mm. The burrow apparently ended 75 cm. below the surface. I continued the excavation to a depth of 90 cm. and 45 cm. in diameter without finding any cells. At this point I had to abandon the digging because I had gotten under the road surface.

Typical *bicornuta* Guerin has been recorded as preying on several species of billbugs belonging to the genus *Calendra.* The biology of that subspecies has been discussed by Rau (1928), Cartwright (1929), Strandtmann (1945), and Krombein (1953).

Cerceris frontata frontata Say

A female *frontata* (72959 A) 21 mm. long entered her burrow at 3:42 p.m. on July 29. The burrow was located in the ditch along the road about 50 meters east of the burrow of *Cerceris bicornuta fidelis* described above. The entrance was in a small depression 75 mm. in diameter and 100 mm. in depth. There was a low pile of loose excavated soil around the entrance, which had been piled there since the heavy rain of the preceding evening.

The wasp left the burrow at 3:47 p.m. and flew back 5 minutes later carrying a weevil. I netted the wasp and prey and released the former. The weevil was a specimen of *Cleonus pulvereus* (Lec.) 11.5 mm. long. It was still thoroughly paralyzed by that evening and exhibited no reflex movements; however, it had voided some fecal pellets.

On July 31 at 9 a.m. the burrow was closed from within with a plug of loose soil, but the entrance was open by 9:28. I captured the wasp at 10:15 as she crawled out of the depression surrounding the burrow entrance. The burrow, which was about 15 mm. in diameter, was slightly sinuate and went nearly straight downward to a depth of 53 cm. Then it turned at right angles and ran very slightly upward or horizontally for about 25 cm. About 22 cm. along this horizontal section and 90 mm. to the right of it I cut into a cell destroying the contents except for one bulky weevil of a species of *Eupagoderes*. Another cell 25 mm. further along the horizontal section and 90 mm. to its right held a half-grown *Cerceris* larva and about 6 weevils or remains thereof. The boring then went downward at an angle of 45° for 14.5 cm. and ended about 64 cm. below the ground surface. There was a third cell about 11 cm. down this last section and 25 mm. to its left; it contained 6 specimens of *Cleonus pulvereus* from 10 to 13 mm. long, one of them with a wasp egg on the thoracic sternum. The cell was horizontal and about 13 mm. in diameter.

In some notes on the biology of *frontata raui* Rohwer, Rau (1928) recorded that subspecies as preying on two weevils, *Thecesternus humeralis* (Say) and *Lixus concavus* Say.

Eucerceris triciliata Scullen

I discovered a burrow of this species on July 26 about 15 meters east of the nest of *Cerceris bicornuta fidelis* discussed above. The burrow was in the ditch along the roadside on a slight slope.

On July 27 at 4:10 p.m. I caught the wasp (72659 A) returning to her burrow with a small weevil. I kept the weevil and released the wasp. She returned 9 minutes later with another weevil, which I took from her also. She flew back again at 4:33, hovered near the entrance for several seconds, and then flew in. I did not see her leave, but 15 minutes later she flew back with another weevil. At this time the wind was so strong that she could not fly into the burrow, but landed a short distance from the entrance and crawled in. Both weevils which I took from the wasp were specimens of *Minyomerus languidus* Horn, 3.0 and 3.5 mm. long; the smaller one could move only its tarsi that evening, and the larger one could move its legs and antennae but was unable to walk.

I began to dig up the burrow at 9:30 a.m. on July 28. The ground to a depth of 50 mm. consisted of loose soil with some intermixed gravel; below this was a layer of hardened mud. Several minutes after starting to dig I caught a newly eclosed female *triciliata* when she tried to leave the burrow. The burrow was 4.5 mm. in diameter, began on a 15° slope toward the north, went downward toward the east at an angle of 75° for 50 mm., and then became almost perpendicular (85°). Another burrow branched off toward the south at a depth of about 18 cm.; the mother *triciliata* 11.5 mm. long with greatly eroded mandibles and frayed wings was recovered from this burrow. At 36 cm. the original burrow turned to the south at an angle of 60°. I caught a newly eclosed male *triciliata* when he tried to leave the burrow at this depth. I was unable to trace the two burrows beyond a depth of 43 cm. However, I continued the excavation to a depth of 75 cm. and recovered the following: two old cocoons with attached weevil fragments at the 46 cm. level (the two newly eclosed wasps mentioned earlier may have emerged from these cocoons); some paralyzed weevils in a cell and two newly spun cocoons with attached weevil remains at a depth of 49 cm., all separated from each other by short distances; and three more newly spun cocoons with attached weevil fragments at depths of 52, 54, and 57 cm. Three of the newly spun cocoons contained prepupae and two contained pale pupae.

The cocoons were 12–13 mm. long, 6 mm. in diameter across the middle, and tapered slightly toward the rounded ends. They were completely encrusted with the dismembered exoskeletons of the weevil prey. All weevils were specimens of *Minyomerus languidus,* 3.0–3.5 mm. long. One cocoon had 39 pairs of weevil elytra adhering to the surface, a second cocoon had 41 pairs of adherent elytra.

Additional observations on this species would be very desirable. The limited data recorded above suggest that a female may have a prolonged period of nesting activity. Offspring from the first cells stored by the mother apparently emerge as adults before the eggs that will produce some of their siblings have been laid.

It would be of great interest to learn something about the subsequent nesting activities of the eldest daughters. Would each one establish herself at a new nesting site, or would they possibly continue to use the old burrow entrance and merely dig subsidiary burrows of their own off the main burrow?

The few published observations on other species of *Eucerceris,* namely those on *flavocincta* Cresson by Scullen (1939) and by Bohart and Powell (1956), and those on *ruficeps* Scullen by Linsley and MacSwain (1954), indicate some diversity in nesting habits. Both species also prey on weevils, but larger species are usually used, so that fewer weevils are required per cell.

E. flavocincta constructs several cells 7.5–12.5 cm. below the surface; Scullen records it as having a silken cocoon with adherent beetle remains, but Bohart and Powell state that there is no cocoon.

E. ruficeps is more closely related to *triciliata,* and some details of the biology are similar. Linsley and MacSwain found that it utilizes abandoned vertical burrows of the halictine bee *Sphecodogastra aberrans* Cwfd. for the vertical section of its burrow and then constructs a lateral oblique burrow of its own 20 to 23 cm. below the surface. Four or 5 cells were found from 28 to 42 cm. below the surface; some of these contained larvae in cocoons with adherent beetle remains, and some contained moldy weevils or puparia of parasitic flies. They found two females in one burrow, but were unable to determine which of these could be associated with the cells and weevils found in that burrow. They commented that "the burrow evidence might be interpreted to indicate that the species is double-brooded," an inference which is supported by my findings in the nest of *triciliata.*

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DESCRIPTION OF A NEW SPECIES OF MARTYRINGA (LEPIDOPTERA: OECOPHORIDAE) WITH A NOTE ON ITS BIOLOGY

By RONALD W. HODGES

Two larvae of an unknown species of Lepidoptera from Alexandria, Louisiana, were given to me by D. J. Pirone. After the adults emerged, it was determined that they were a new species of *Martyringa.*

Martyringa ravicapitis, sp. n.

Labial palpus, head, thorax, and forewing ochreous, heavily overlaid with dark fuscous. Second segment of labial palpus (Fig. 1) dark fuscous on basal two-thirds on outer side; some fuscous based on inner side; third segment with fuscous annulus on basal half. Scape of antenna fuscous except for narrow terminal ochreous annulus; segments of shaft with narrow, fuscous basal rings, ochreous distally. Forewing (Fig. 2) with two black spots at basal third, anterior one ending where posterior one begins and preceded by a patch of skewed scales (this area appears translucent from the undersurface), followed by an ochreous bar; third black spot at end of cell; black spot near base along dorsal margin, gradually moving costad; series of black pencils on outer third of wing; wavy, subterminal line; fuscous terminal line; apex ochreous; cilia fuscous basally, gray distally from apex to tornus, gray dorsally. Hind wing fuscous; cilia ochreous tipped at apex (fuscous basally) becoming fuscous posteriorly. Legs blackish fuscous outwardly with ochreous annuli at tips of segments and at middle of hind tibia.

Female genitalia: (Fig. 4) Genital plate subrectangular, emarginate at tip; ostium a semicircular slit at base of genital plate; posterior third of ductus bursae heavily sclerotized, terminating in a wider, semicircular-shaped portion which overlaps the genital

HODGES

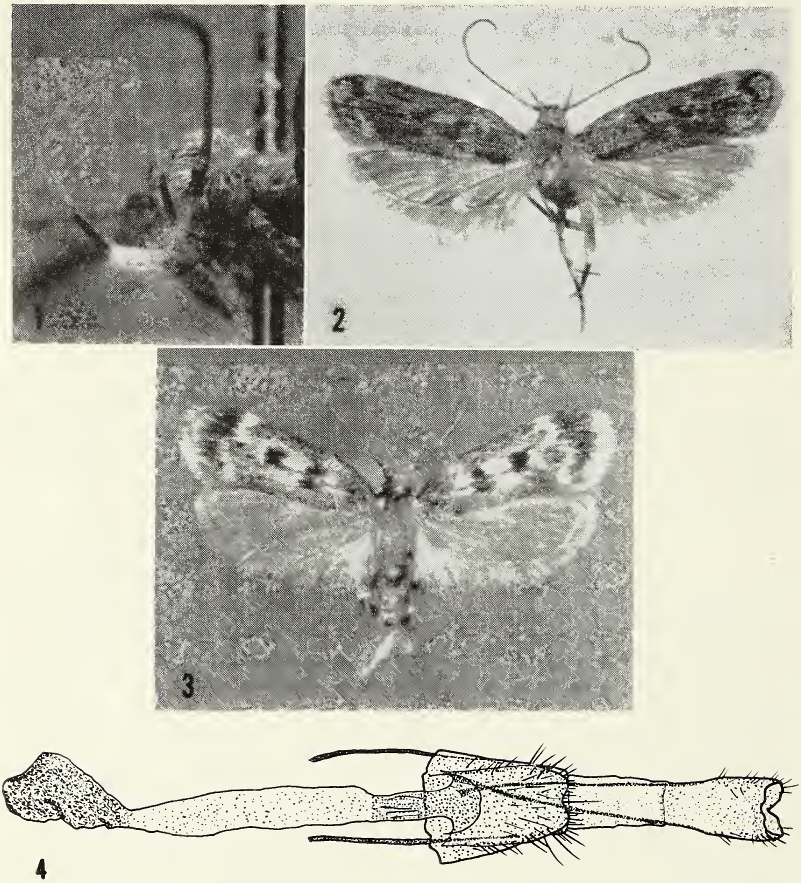

Fig. 1, *Martyringa ravicapitis* Hodges, sp. n., fronto-lateral aspect of head. Fig. 2, *M. ravicapitis* Hodges, sp. n. type, Alexandria, Louisiana, February 24, 1950. Fig. 3, *M. latipennis* (Wals.), Six Mile Creek, Ithaca, New York, July 6, 1957, J. G. Franclemont. Fig. 4, *M. Ravicapitis* Hodges, sp. n., type, ventral view of female genitalia.

plate; remainder of ductus bursae lightly sclerotized; bursa copulatrix with small spines which give it a reticulate appearance.

Alar expanse: 20 mm.

Holotype: female, Alexandria, Louisiana, February 24, 1959, reared by R. W. Hodges. Type in U.S.N.M.

Paratype: female, Alexandria, Louisiana, May 5, 1950, reared by R. W. Hodges. In my personal collection.

Martyringa ravicapitis differs from *M. latipennis* (Wals.) (Clarke, 1941, Fig. 90) in that the genital plate of *ravicapitis* is more than twice as broad as the connection of the ductus bursae, whereas, at this juncture the two are equal in *latipennis*. Superficially, *ravicapitis* appears much darker than *latipennis* (Fig. 2); the two basal black spots which are offset in *ravicapitis* are nearly vertical in *latipennis;* and the subterminal line of *ravicapitis* is narrower and more noticeably curved than that of *latipennis*. The hind wing of *latipennis* is more nearly quadrate than that of *ravicapitis*.

Biological Note.—The first larva was found associated with frass and eggs of *Anisomorpha ferruginea* (Beauv.) (Orthoptera, Phasmidae) located on and under some partially decaying boards. At the time the phasmid eggs were collected, no larva was noticed. However, about one month later a tube-like structure composed of frass, eggs, and detritus was detected in the mixture. This structure was turned over to the author by D. J. Pirone after it had been separated from the detritus and placed in a rearing tin. The adult emerged in four weeks. It is likely that the larva feeds on the frass or decaying wood (Clarke, 1941, p. 230) because it was associated with these two items for eight weeks in captivity. Later, a second specimen was found, and it produced an adult. Unfortunately, only two specimens were found; thus, there was no opportunity to study the larva in detail.

Grateful acknowledgment is made to the Grace H. Griswold Fund of the Department of Entomology of Cornell University for assuming the expense of engraving the plates.

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OBSERVATIONS ON THE SCELIONID COMPONENT OF A GRASSLAND INSECT FAUNA[1]

By U. N. Lanham and F. C. Evans[2]

The following observations on wasps of the family Scelionidae were made in connection with an ecological study of the insect fauna of a 12-acre grassland area on the Edwin S. George Reserve, Livingston County, Michigan. This long-abandoned field is on dry sandy soil (Fox sandy loam) and has a vegetation cover dominated by the two grasses *Poa compressa* and *Aristida purpurascens* but including a considerable number of subdominant forms (Evans & Dahl, 1955).

A surprising feature of the insect fauna is the diversity of scelionid wasps, which are small or minute parasites of the eggs of other insects. Twenty-five species were recorded (Table 1; identifications are by C. F. W. Muesebeck, U. S. National Museum), a number which is nearly 10% of the 270 species listed in a catalogue of the Hymenoptera of North America (Muesebeck *et al.*, 1951) and which can be compared with a total of 24 species listed for the State of New York (Leonard, 1928). This relatively large number of species from a small, intensively studied area probably reflects the fact that this group of insects is still poorly known. To compare the Scelionidae with some other groups of parasitic Hymenoptera on the field, the 57 species of Ichneumonidae which we have recorded represent about 2% of the North American ichneumonid fauna (as listed in Muesebeck's catalogue), the 65 species of Braconidae about 6% of the braconid fauna.

The most conspicuous member of the family Scelionidae on the field is *Scelio bisulcus* Ashmead, which is found in numbers clinging to the underside of the abdomen of adult female grasshoppers of the genus *Melanoplus*. The occurrence, in 1957, of this wasp on *M. confusus* Scudder, *M. keeleri luridus* (Dodge) and *M. femur-rubrum* (DeGeer) has already been reported by us (Lanham & Evans, 1958). Additional observations made in 1958 afford some measure of the intensity of infestation. In early July, 1958, the adult female *Melanoplus* population on the field was sparse, estimated at about 0.001 individuals per square meter. On July 10, a search for mature *Melanoplus* females yielded only 8 individuals,

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of which 6 carried a total of 10 *S. bisulcus* (2 grasshoppers carried 2 wasps each, 1 carried 3). Of 18 grasshoppers examined in July, 12 carried a total of 18 wasps. The hosts were probably all *M. confusus,* the characteristic early summer species on the field. (In 1958, the hosts were released and were not taken to the laboratory for certain identification; in 1957 the early hosts, also with multiple infestations, had been positively determined as *M. confusus.*)

Later in the summer, *Melanoplus confusus* declines in numbers (it disappears by the end of August), but the total density of the mature *Melanoplus* population rises as *M. keeleri luridus* and *M. femur-rubrum* become prominent, along with small numbers of *M. mexicanus.* In September, 1958, the total adult female population of *Melanoplus* on the field was estimated at approximately 0.1 per square meter. Infestation of these by *Scelio bisulcus* was comparatively light, and no instances of multiple infestation were observed. Single wasps were carried by 2 of 18 *Melanoplus* examined on September 12, by 1 of 12 examined on September 19, by 1 of 10 examined on September 25, and by 1 of 7 examined on October 6. The percentage of infestation of the late summer population of *Melanoplus* females is thus on the order of 10%, in contrast to 60–70% on the population of early summer. However, the concentration of the hosts in the late summer is about 100 times that of early summer, so that the size of the *Scelio bisulcus* population in September–October appears to be considerably (from 5 to 10 times) larger than that in July.

Scelio bisulcus was not found on grasshoppers in August in any of the three years of this study (1957–59). This suggests the occurrence of either (1) two successive generations of the wasp or (2) two populations with different times of emergence and consequently with different hosts. If two generations of *Scelio* actually exist, we have the interesting phenomenon of the first generation being maintained by a single species of host (*M. confusus*) while the second has access to several host species. The comparatively heavy burden of parasitization on *M. confusus* would tend to lessen any competitive advantage this grasshopper has over its congeners by virtue of its earlier development and maturity.

The tenacity with which *Scelio* holds on to its hosts has already been noted (Lanham & Evans, 1958). In several cases among our 1958 observations, however, the wasp let go and left its host altogether when the grasshopper was picked up. In one instance, the wasp ran about over the collector's hand for a few minutes, then returned to attach itself to the abdomen of the grasshopper, in the usual position far forward on the under side. The movements of the wasp on the grasshopper suggested that the final stimulus which caused it to stop and attach itself was mechanical contact in the angle between the base of the femur and the abdomen.

A grasshopper that has carried one or more *Scelio* can easily be recognized by the conspicuous melanotic scars left by the wasps on the underside of the first or second abdominal segments. These show up well on the yellowish integument of fresh specimens of *Melanoplus,* but are difficult to see on dried ones.

Table 1. List of Scelionidae collected on a 12-acre abandoned field, Edwin S. George Reserve, Livingston Co., Michigan, 1957–1959.

- Telenominae
    - *Telenomus emersoni* Girault
    - “ *minimus* Ashmead
    - “ spp. 3, 4, 5
- Baeinae
    - *Trichasius* sp.
    - *Acoloides* howardii Ashmead
- Teleasinae
    - *Teleas* n. sp.
    - *Trimorus* americanus (Ashmead)
    - “ spp. 2, 3, 4
    - *Trisacantha* spp. 1, 2
- Scelioninae
    - *Sparasion* sp.
    - *Scelio bisulcus* (Ashmead)
    - “ *calopteni* Riley
    - *Oethecoctonus oecanthi* (Riley)
    - *Hadronotus* sp.
    - “ n. sp.
    - *Ceratoteleia marlattii* (Ashmead)
    - *Pegoteleia* sp.
    - *Macroteleia macrogaster* Ashmead
    - “ spp. 2, 3

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RECOGNITION OF BUMBLEBEE TYPE SPECIMENS, WITH NOTES ON SOME DUBIOUS NAMES (HYMENOPTERA: APIDAE)[1]

By H. E. Milliron, Glen Dale, West Virginia

This paper deals with certain Western Hemisphere and circumpolar species for which lectotypes have not been previously indicated. Some of the scientific names referred to in the following list are synonyms, or have no nomenclatorial standing for various reasons. However, the present objective is solely one of associating, or fixing each particular name with the taxon that was originally described or intended, and no effort is made here to revise species or change nomenclature. All material was studied by the writer, whose decisions were guided by the conventional meaning of the term lectotype, *i.e.,* it should be a type, cotype or paratype that agrees with the original published description and the data associated with it. Every effort was made to complete the examination of all available specimens of the type series before a lectotype was selected in each case. Types of some few species described by early workers caused the usual difficulties encountered in the study of old material, namely, parts of specimens were missing, or the condition was poor; labels were lacking, inadequate, or their genuineness was questionable; or there was the possibility that the specimens themselves might not be the originals. In such cases, search and research were necessary before a satisfactory decision

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could be reached. Except at Lund, Sweden, where a red "lectotypus" label was used, each specimen that was selected is marked with a black-bordered white label on which the following is given: Lectotype, followed by the sex (♀ or ♂) or neuter caste (☿), the scientific name (and abbreviated author name) under which the species was originally described, the writer's name and the current year.

Names of species which are known to have been described from unique types are not included; where such uniques have been examined, they have been marked with a holotype label in the same manner as the lectotype. All types selected by me constitute, in reality, holotypes, whether the type series studied comprises a single or a composite species. When a composite species was involved, care was exercised in selecting from the type series a specimen which agrees with the original description, type locality and other published data.

Most of the types studied at the British Museum (N.H.) were not marked as lectotypes; the specimens had been segregated previously and are properly identified as types. Pertinent specimens in the Banks, Fabricius, Kirby and Westwood Collections were simply labeled "types", because circumstances made it virtually impossible to apply the concept of lectotype to most of such material. Also, in a few instances, it was difficult to establish lectotypes for names of Friese, and in one such case (*vogti*) a neotype seemed desirable to avoid confusion. Lectotypes were indicated for many categories described as infraspecific, but these selections are not included in the following list unless they have some bearing on the establishment, or fixation, of a name.

alboniger Fkln., (*Bombus*), 1915, ♀, Cerro Zunil, [Guatemala], B.M. Type Hym. 17B1041. In good condition, except the following parts are missing: Two segments of each the left mid- and the hind tarsus, the right antenna and the right leg beyond the coxa. Typical as described. British Museum (N.H.), London, England. Labeled as type by Franklin.

americanorum F., (*Apis*), 1775, ☿, (No label). Poor condition; severe dermestid damage; on the left side are missing six segments of the antenna, most of the front leg, one segment of the mid-tarsus and two of the hind tarsus; on the right side, the hind leg is missing beyond the base of the femur; devoid of pubescence over much of the median thoracic area, and at the sides of abdominal terga three and four, and elsewhere the pubescence is generally matted or disorderly. Typical. Kiel Collection (Fabrician), Universitetets Zoologiske Museum, Copenhagen, Denmark. Labeled type by me.

arcticus Kby., (*Bombus*), 1821, ♀, (No locality). B.M. Type Hym. 1043. In good condition, except two segments of the left hind tarsus are missing, and the pubescence on the vertex and over much of the abdomen is matted. Typical. British Museum (N.H.), London, England. Previously labeled by someone as type.

baeri Vach., (*Bombus*), 1904, ♂, Lara, Province Tucuman, Argentina. In good condition and typical of the male as described. Museum National d'Histoire Naturelle, Paris, France. Previously indicated by someone as holotype, and labeled as lectotype by me.

balteatus Dahlb., (*Bombus*), 1832, ☿, (No locality). In good condition. A slight discrepancy noted between the specimen and the original description wth respect to coloration of abdominal tergum four; otherwise, the specimen is typical. Dahlbom Collection, Zoological Institute, University of Lund, Lund, Sweden. Labeled as lectotypus by me. I am not yet convinced that this represents the specimen supplied Dahlbom by Schönherr, but it does appear to be one of the originals.

bellicosus Sm., (*Bombus*), 1879, ♀, (No locality). B.M. Type Hym. 17B1049. Good condition, lacking only the left claw of the right mid-tarsus, and two segments of each hind tarsus; the pubescence is slightly matted at places on the thoracic dorsum. Typical. British Museum (N.H.), London, England. Labeled type by Smith.

bicolor Fr., (*Bombus*), 1903, ☿, Ecuador. The type has not been recognized to date. Two specimens (☿ and ♂, Venezuela, both in good condition and typical as described) in the Zoologische Museum, East Berlin, Germany are labeled "type" by Friese, but neither meets the requirements of a lectotype.

brachycephalus Handl., (*Bombus*), 1888, ♀, Mexico. In good condition, except on the left side two segments of the mid-tarsus and three segments of the hind tarsus are gone; on the right side, two segments of the mid-tarsus and all of the hind leg beyond the femur are missing; much of the pubescence is lacking on the anterior part of the mesoscutum. Typical. Naturhistorische Hofmuseum, Vienna, Austria. Labeled as lectotype by me.

brasiliensis Sm., (*Apathus*), 1854, ♀, Para, Brazil. B.M. Type Hym. 17B1068. In good condition and typical of the species it represents. British Museum (N.H.), London, England. Labeled type (by Smith?).

brasiliensis Lep., (*Bombus*), 1836, ♀, Brazil. Condition good, with only one segment of the left hind tarsus gone; pubescence matted over the left pleuron and on the pronotum and anterior part of the mesonotum. Not quite typical for the species. Westwood Collection, Hope Department, University Museum, Oxford, England. Labeled type by me.

butteli Fr., (*Bombus*), 1903, ☿, Marcapata, Peru. Condition good, except the specimen lacks seven segments of the left antenna, and the right mid-leg beyond the femur. Typical as described. Zoologische Museum, East Berlin, Germany. Labeled as a type by Friese, and as lectotype by me.

californicus Sm., (*Bombus;* a composite species), 1854, ♀, California. B.M. Type Hym. 17B1223. Good condition, except missing the following parts on the right side: Nine segments of the antenna, three segments of the fore tarsus and two segments of the hind tarsus. Typical for the sex as described. British Museum (N.H.), London, England. Labeled as type by Smith.

carbonarius Handl., (*Bombus*), 1888, ♂, Ypanema [Ipanema, now known as Bacaetava, near Varnhagem, S.P.], Brazil. Condition good. Typical, except somewhat larger than the average of this sex. Naturhistorische Hofmuseum, Vienna, Austria. Labeled as lectotype by me.

cayennensis F., (*Apis;* a composite species), 1798, ☿, (No locality). Specimen in poor condition, lacking the head and all legs (except hind coxae, and the left hind leg); thorax, especially beneath, and the wing margins show severe dermestid damage; pinned through the apparent second abdominal segment. Not entirely in agreement with the original diagnosis. Kiel Collection (Fabrician), Universitetets Zoologiske Museum, Copenhagen, Denmark. Labeled type by me.

chilensis Spin., (*Bombus*), 1851, ♂, Chile. Condition good, except on the left side seven segments of the antenna and both the mid- and the hind tarsi are lacking; the pubescence on the thoracic dorsum is somewhat matted, and also that covering a small spot on the left side of the apical abdominal terga. Typical of the male of the species represented. Museo, Instituto di Zoologia dell Universita, Turin, Italy. Labeled as lectotype by me.

citrinus Sm., (*Apathus*), 1854, ♂, United States. B.M. Type Hym. 17B1060. Good condition, except on the right side four segments of the antenna, and four segments of the mid-tarsus are gone, and all of the left mid-leg is missing. Typical. British Museum (N.H.), London, England. Labeled type by Smith.

coccineus Fr., (*Bombus*), 1903, ♂, Peru. Condition good; genitalia withdrawn but still attached. Typical. Zoologische Museum, East Berlin, Germany. Labeled as a type by Friese, and as lectotype by me.

dahlbomii Guér., (*Bombus*), 1835, ♀, Chile. In good condition, except the claws on the left mid-leg, and the last segment of the right mid-tarsus are missing; some of the pubescence on the thoracic dorsum is gone left of the pin and over the anterior part of the scutellum. Typical. Ryksmuseum von Natuurlijke Historie, Leiden, Netherlands. Labeled as a type by Guérin, and as lectotype by me.

diligens Sm., (*Bombus;* a composite species), 1861, ♀, Oajaca [Oaxaca], Mexico. B.M. Type Hym. 17B1056. Good condition, lacking only two segments of the left fore tarsus and some pubescence on the vertex. Not entirely typical. British Museum (N.H.), London, England. Labeled type (by Smith?), and lectotype by me.

dolichocephalus Handl., (*Bombus*), 1888, ♀, Mexico. Condition very good, wanting only one segment of the right hind tarsus. Typical. Naturhistorische Hofmuseum, Vienna, Austria. Labeled as lectotype by me.

excellens Sm., (*Bombus*), 1879, ♀, Venezuela. B.M. Type Hym. 17B1048. In good condition, except it lacks the left antenna, and one segment of the left front tarsus; the pubescence is matted over the center of the thoracic dorsum. Typical of the species represented. British Museum (N.H.), London, England. Labeled as type by Smith.

fervida F., (*Apis*), 1798, ☿, (No label). Poor condition due to dermestid damage; antennae and much of the head capsule are gone, as are the fore legs and some of the prothorax; one tarsal segment is missing on all remaining legs except the middle one. Typical in most respects. Kiel Collection (Fabrician), Universitetets Zoologiske Museum, Copenhagen, Denmark. Labeled type by me.

formosus Sm., (*Bombus*), 1854, ♀, Oajaca [Oaxaca], Mexico. B.M. Type Hym. 17B1052. In good condition, lacking only two segments of the left mid-tarsus. Almost typical for the species. British Museum (N.H.), London, England. Labeled type by Smith.

fraternus Sm., (*Apathus*), 1854, ♂, North America. B.M. Type Hym. 17B1038. Specimen in very good condition, except it lacks two segments of the right mid-tarsus; some of the pubescence is matted about the center of the thoracic dorsum. Typical. British Museum (N.H.), London, England. Labeled type by Smith.

frigidus Sm., (*Bombus*), 1854, ♀, Arctic America (Arctic Coast, 67½–68½). B.M. Type Hym. 17B1042. Condition good, except it lacks the left hind tarsus, and all the right hind leg beyond the coxa; the pubescence is slightly matted over places on the thoracic dorsum and on some of the abdomen. Typical. British Museum (N.H.), London, England. Labeled type by Smith.

funebris Sm., (*Bombus*), 1854, ♀, Quito [Ecuador]. B.M. Type Hym. 17B1057. Condition fair, lacking on the left side the antenna, two segments of the front tarsus, all of the mid-tarsus and four segments of the hind tarsus, and the tip of the hind wing; on the right side, the mid-leg beyond the tibia, and three segments of the hind leg are missing; the mesonotum is damaged and devoid of the normal amount of pubescence. Smaller than the average. British Museum (N.H.), London, England. Labeled type by Smith.

grandis Westw., (*Bombus*), 1840, ♀, Val[pariso, Chile]. In very good condition, lacking four segments of the right fore tarsus only. Typical of the species it represents. Westwood Collection, Hope Department, University Museum, Oxford, England. Labeled as type by me.

griseocollis De G., (*Apis*), 1773, ☿, (No locality). Condtion very good, except that two segments of the left hind tarsus are wanting. Typical. De Geer Collection, Naturhistoriske Riksmuseet, Stockholm, Sweden. Labeled lectotype by me; it is the only specimen now standing under this name in the De Geer Collection.

groenlandicus Sm., (*Bombus*), 1854, ♀, West Coast of Greenland. B.M. Type Hym. 17B962. The specimen lacks three segments of both the left front tarsus and hind tarsus; the pubescence is matted along the posterior border of the scutellum; otherwise, the condition is good. Typical for the species it represents. British Museum (N.H.), London, England. Labeled type by Meade-Waldo.

handlirschi Fr., (*Bombus*), 1903, ♂, Marcapata, Peru. In good condition. Typical. Zoologische Museum, East Berlin, Germany. Labeled a type by Friese, and as lectotype by me.

haueri Handl., (*Bombus*), 1888, ♀, Takubaya, Mexico. Condition very good, except that two segments of the right hind tarsus are missing. Typical. Naturhistorische Hofmuseum, Vienna, Austria. Labeled as lectotype by me.

hyperboreus Schön., (*Bombus*), 1809, ♀, Lapponia [Lapland]. Good condition, except that the specimen lacks the following parts: On the left side, four segments of the mid-tarsus, the hind leg beyond the femur; on the right side, two segments of the mid-tarsus, three segments of the hind tarsus, and the hind wing; the disc of the thoracic dorsum is damaged on the left side, and the pubescence surrounding this area is matted and tangled.

Typical. Naturhistoriske Riksmuseet, Stockholm, Sweden. Labeled lectotype by me.

insularis Sm., (*Apathus*), 1861, ♀, Vancouver Island, [British Columbia]. B.M. Type Hym. 17B1061. In good condition, and nearly typical. British Museum (N.H.), London, England. Labeled type (by Smith?).

intrudens Sm., (*Apathus*), 1861, ♀, Oajaca [Oaxaca], Mexico. B.M. Type Hym. 17B1062. Condition good, except that on the left side the specimen lacks the right claw of the fore tarsus, two segments of the mid-tarsus and four segments of the hind tarsus; on the right side, the right claws of both the mid- and hind tarsi are gone; the tip of the ovipositor is also missing. Typical. British Museum (N.H.), London, England. Labeled type (by Smith?).

jonella Kby., (*Apis*), 1802, ♂, (No locality). No. 90, K.2–338. The specimen is in fair condition, with the following parts missing: Both antennae beyond the scape, all of the left fore leg and the left mid-leg beyond the tibia; dermestid damage is evident. Typical of the male. Kirby Collection, British Museum (N.H.), London, England. Labeled as type by me.

lapponica F., (*Apis*), 1793, ☿, (No locality). Condition fair, except that on the left side it lacks the antenna and part of the front tibia; on the right side, part of the terminal antennal segment is gone, as is also all of the middle leg; loss due to dermestid infestation; the pubescence is disorderly and slightly matted at places. Typical. Kiel Collection (Fabrician), Universitetets Zoologiske Museum, Copenhagen, Denmark. Labeled type by me.

laboriosus Sm., (*Bombus*), 1861 (*nec* Fabricius, 1804), ♀, Oajaca [Oaxaca], Mexico. B.M. Type Hym. 17B1051. Good condition, except it lacks all of the right hind leg, and the left hind one is completely detached and glued to Smith's identification label. Typical of the species it represents. British Museum (N.H.), London, England. Labeled as type (by Smith?).

lateralis Sm., (*Bombus*), 1879, ☿, Val de Fuego, Guatemala. B.M. Type Hym. 17B1039. The specimen is without nine segments of the left antenna, but is otherwise in good condition. Typical worker of the species it represents. British Museum (N.H.), London, England. Labeled as type by Smith.

melaleucus Handl., (*Bombus;* a composite species), 1888, ☿, (No locality). In good condition, and typical as described. Naturhistorische Hofmuseum, Vienna, Austria. Labeled as lectotype by me.

melanopygus Nyl., (*Bombus*), 1848, ♂, Sitcha [Sitka, Alaska]. Condition good. Almost typical of the species. Zoological Museum, University of Helsinki, Helsinki, Finland. Labeled lectotype by me.

modestus Sm., (*Bombus*), 1861 (*nec* Eversmann, 1852; *nec* Cresson, 1879), ♀, Oajaca [Oaxaca], Mexico. B.M. Type Hym. 17B1046. Good condition, lacking only four segments of the right hind tarsus and one segment of the right middle tarsus. Typical of the species it represents, but its abdominal coloration is not in perfect agreement with the original description. British Museum (N.H.), London, England. Labeled type (by Smith?).

morio Swed., (*Apis*), 1787 (*nec* Fabricius, 1793), ♀, Brazil. In fair condition, without left antenna, two segments of the left front tarsus and one segment of the right hind tarsus; devoid of the usual amount of pubescence on the vertex and on the mesonotum; pubescence somewhat matted in places. Typical of the species it represents. Banks Collection, British Museum (N.H.), London, England. Previously labeled by someone as type, and by me as type also.

nidulans F., (*Apis*), 1798, ♂, (No locality). Severely damaged by dermestids; the antennae and much of the head capsule are gone; on the right side, most of the hind leg is missing beyond the trochanter, but on the left side all the leg parts are present, except one segment of the mid-tarsus; much of the pubescence on the center of the thoracic dorsum and on the sides of abdominal terga four and five is missing, and most of what remains elsewhere on the body is matted. Typical for the male of the species represented. Kiel Collection (Fabrician), Universitetets Zoologiske Museum, Copenhagen, Denmark. Labeled type by me.

nigripes Hal., (*Bombus*), 1836, ♀, Chile. B.M. Type Hym. 17B-1053. Good condition, except seven segments of the right antenna, and the right hind leg beyond the femur are wanting; some of the pubescence is matted over the thoracic dorsum and abdominal terga. Typical for the species it represents. British Museum (N.H.), London, England. Previously labeled as type (by Haliday?).

nivalis Dahlb., (*Bombus*), 1832, ♀, Torneåträsk, [Lapland]. Good condition, missing only one segment of the left hind tarsus. Typical as described, though somewhat smaller than the average queen. Zetterstedt Collection, Zoological Institute, University of Lund, Lund, Sweden. Labeled paratypus by Kruseman, and lectotypus by me.

opifex Sm., (*Bombus*), 1879, ☿, Mendoza, [Argentina]. B.M.

Type Hym. 17B1015. Condition fair; on the right side, the antenna and three segments of the mid-tarsus are gone; dermestid damage is noticeable on the right fore femur, and on the abdomen, of which the apparent third and fourth sterna are gone, and the distal part (terga five and six, and corresponding sterna) is glued up-side-down to the fourth tergum; the pubescence is matted on the thoracic dorsum posterior to the center, and on the anterior part of the scutellum. Typical. British Museum (N. H.), London, England. Labeled type by Smith.

ornatus Sm., (*Bombus;* a composite species), 1854, ♀, Rochester, New York. The condition is good, and the specimen is typical for the species it represents. British Museum (N.H.), London, England. Labeled as lectotype by me.

pennsylvanica De G., (*Apis*), 1773, ♀, (No locality). In good condition, except that the front wings are damaged at their bases, caused by forced subsequent setting. The specimen agrees with the original description and figure, and presents conclusive evidence of having been the one used by De Geer to make his original drawing; coloration not entirely typical for the species. De Geer Collection, Naturhistoriske Riksmuseet, Stockholm, Sweden. Labeled lectotype by me. This specimen, which was discovered in the general collection of the above institution, has been returned to the De Geer Collection, where it is the only one now standing under this name.

pleuralis Nyl., (*Bombus*), 1848, ♀, Sitcha [Sitka, Alaska]. In good condition. The specimen agrees with the original description, but its color is not entirely typical for the species it represents. Zoological Museum, University of Helsinki, Helsinki, Finland. Labeled as lectotype by me.

polaris Curt., (*Bombus*), 1835, ♀, (No locality). B.M. Type Hym. 17B1054. Good condition, except that both antennae are gone, and the left mid-leg has been glued to the body; the pubescence is somewhat matted on the thoracic dorsum, and on parts of the first two abdominal terga. Typical of the species it represents. British Museum (N.H.), London, England. Labeled as type by Smith.

robustus Sm., (*Bombus*), 1854, ♀, Colombia. B.M. Type Hym. 17B1059. Condition good, the specimen being devoid of pubescence only in places on the thoracic dorsum and on the abdominal terga. Nearly typical. British Museum (N.H.), London, England. Labeled type by Smith.

robustus var. *hortulans* Fr., (*Bombus*), 1904, ♀, Banos, [Ecuador]. In good condition, except on the left side, nine segments of the antenna, the mid-leg beyond the femur, and four segments of the hind tarsus are missing; on the right side, eight segments of the antenna, four segments of the mid-tarsus and all of the hind tarsus are gone. Typical as described. Zoologische Museum, East Berlin, Germany. Labeled a type by Friese, and as lectotype by me.

rubicundus Sm., (*Bombus*), 1854, ♀, Colombia. B.M. Type Hym. 17B1058. Good condition, missing only two segments of each front tarsus, and two segments of both the right mid-tarsus and the right hind tarsus. Typical. British Museum (N.H.), London, England. Labeled as type by Smith.

rubriventris Lep., (*Bombus*), 1836, ♀, St. Domingue [Santo Domingo]. The specimen is in good condition, with only three segments of the left mid-tarsus gone, and a small amount of pubescence matted along the posterior margin of the thoracic disc. Typical as described. Westwood Collection, Hope Department, University Museum, Oxford, England. Labeled as type by me. Lepeletier probably based his description on a single specimen, but of this I cannot be sure.

schneideri Fr., (*Bombus*), 1903, ♀, S[an] Carlos, Costa Rica. In good condition, except some pubescence is absent postmedially on abdominal tergum two, and that on the remainder of the abdomen is irregularly matted. Typical for this form of the species. Zoologische Museum, East Berlin, Germany. Labeled as a type by Friese, and as lectotype by me.

scrimshirana Kby., (*Apis;* a composite species), 1802, ☿, (No locality). No. 92, K.2–342. The specimen lacks antennae (except the left scape) and the left fore leg beyond the femur; evidence of dermestid damage. Typical worker of the species it represents. Kirby Collection, British Museum (N.H.), London, England. Labeled type by me.

sitkensis Nyl., (*Bombus*), 1848, ♀, Sitcha [Sitka, Alaska]. In good condition, with only some of the pubescence matted on the thoracic dorsum near the left tegula and on some of the abdominal terga. Typical. Zoological Museum, University of Helsinki, Helsinki, Finland. Labeled as lectotype by me. Also, in the same institution and a part of the type series, a male, lacking only the right front leg, was labeled by me as lectoallotype.

steindachneri Handl., (*Bombus*), 1888, ♂, Cuernavaca, Mexico. In good condition, except that on the left side, the mid-leg is gone beyond the coxa, and all the hind leg; on the right side, the antenna beyond the scape, and the mid-leg beyond the trochanter are missing; the pubescence on the left pleuron is irregularly matted, and it is absent on parts of abdominal terga three to five; the genitalia are withdrawn, but remain attached. Typical. Naturhistorische Hofmuseum, Vienna, Austria. Labeled lectotype by me.

thoracicus Sich., (*Bombus*), 1862, ♀, La Plata, [Argentina]. In good condition, and typical as described. Museum National d'Histoire Naturelle, Paris, France. Labeled lectotype by me.

tricolor Zett., (*Bombus*), 1838 (*nec* Dahlbom, 1832), ♂, Karesuando [Lapland]. Condition good, except that the specimen lacks both hind legs, the right front leg, and the left mid-leg beyond the femur; the right antenna shows dermestid damage, and the pubescence is matted together in clumps over most of the anterior part of the thoracic dorsum; the genitalia have been withdrawn but not removed. Typical for the male of the species represented. Zetterstedt Collection, Zoological Institute, University of Lund, Lund, Sweden. Labeled lectotypus by me.

unifasciatus Sm., (*Bombus*), 1879, ☿, Guatemala. B.M. Type Hym. 17B1047. Condition good. Typical of the species it represents. British Museum (N.H.), London, England. Labeled type by Smith.

vagans Sm., (*Bombus*), 1854, ♀, Nova Scotia. B.M. Type Hym. 17B1040. The specimen is without the left mid-leg beyond the coxa, lacks four segments of the right hind tarsus, seven segments of the left antenna, and ten of the right antenna; otherwise, it is in good condition. Not quite typical for the species. British Museum (N.H.), London, England. Labeled type by Smith.

velutinus Ill., (*Bombus; a composite species*), 1806, ♂, Brazil. In good condition, wanting only four segments of the right antenna; the genitalia are withdrawn but remain attached. Typical of the species it represents. Zoologische Museum, East Berlin, Germany. Labeled as type by Bischoff, and as lectotype by me.

venustus Sm., (*Bombus*), 1861 (*nec* Smith, 1876), ♀, Constancia [Constantia, Brazil]. B.M. Type Hym. 17B1050. In good condition, and typical of the species it represents. British Museum (N.H.), London, England. Labeled type (by Smith?).

violaceus Lep., (*Bombus;* a composite species), 1836, ♀, Brazil. In good condition, except that the thoracic dorsum is cracked over the center to the left tegula, then to the prosternum; pubescence slightly matted over the center of the thoracic dorsum and absent in spots over the abdomen, especially on terga four and five; slightly damaged internally by dermestids. Typical of the species it represents. Westwood Collection, Hope Department, University Museum, Oxford, England. Labeled type by me.

vogti Fr., (*Bombus;* a composite species), 1903, ☿, Huancabamba, N. Peru. Condition very good. Typical as described. Naturhistorische Hofmuseum, Vienna, Austria. Labeled as a type by Friese, but as neotype by me since no specimen of the apparent cotypic series could be found that satisfies all the requirements of a lectotype.

weisi Fr., (*Bombus;* a composite species), 1903, ♀ (not a ☿), S[an] Carlos, Costa Rica. Condition good, except two segments of the left mid-tarsus are lacking and most of the pubescence is irregularly matted, and some of it is lacking on abdominal terga one to three. Typical as described. Zoologische Museum, East Berlin, Germany. Labeled as a type by Friese, and as lectotype by me.

Dubious Names

The following notes apply to the disposition of certain dubious names; of these, only the first can be accepted as having correct reference to a species of bumblebee.

Apis alata F. was described in 1798 (Suppl. Ent. Syst., p. 274, no. 43–4) but no specimens are to be found in the Kiel Collection. In transferring the species to the genus *Bombus* in 1804 (Syst. Piez., p. 352, no. 49), Fabricius emended the name to *elatus,* even in the specific citation to his previous work. It seems impossible to be certain of what species Fabricius had before him, but it is very likely that it was *Bombus fervidus* (F.). The Sehestedt and Tønder-Lund Collection, which is also at the Universitetets Zoologiske Museum in Copenhagen, contains much material seen by Fabricius; included is a male bumblebee under the name *elatus,* but it is the same as *Bombus americanorum* (F.) and is regarded only as a misidentification.

Apis antiguensis F. was described in 1775 (Syst. Ent., p. 380, no. 11) probably from a single specimen supplied by Drury. A conspicuous conflicting error on color was made in the original description. However, the writer is of the opinion that Fabricius had before him a species of carpenterbee and not a bumblebee, despite the fact that a queen (*Bombus amerianorum* (F.)) of the latter, with a label "antiguensis" in Fabricius' handwriting, now stands in the Kiel Collection. This is, in all probability, nothing more than one of Fabricius' common misidentifications of his own species, and neither this specimen, nor the unlabeled conspecific queen beside it is to be accepted as the type of *antiguensis,* as was assumed by Schulz (Berl. Ent. Ztschr., vol. 57, pp. 91 & 101, 1912). Neither specimen agrees with the primary part of the original description. It is very likely that Fabricius returned to Drury his original *antiguensis,* and that it is no longer extant. It is my contention that these two misidentified specimens now in the Kiel Collection were mistakenly placed there under this name in later years by Fabricius himself, and that they have no type value whatever. Under these circumstances, if *antiguensis* cannot be recognized as belonging to *Xylocopa* or to some genus other than *Bombus* (or *Psithyrus*) it would be better to suppress the name altogether.

Bombus laboriosus F. was described in 1804 (Syst. Piez., p. 352, no. 51). It is not a bumblebee. One female is in the Kiel Collection; it bears the name "laboriosa" in Fabricius' handwriting, and belongs in the genus *Emphoropsis.*[1] This specimen is the unique type, as no other specimen of the species could be found in the Bosc Collection at Paris.

Apis marylandica F., described in 1798 (Suppl. Ent. Syst., p. 274, no. 20–1), does not refer to any species of bumblebee. It is not represented in the Kiel Collection. Possibly it refers to a species of *Centris;* a specimen of this genus in the Spinola Collection under the name *Trachina unicincta* Spin. agrees with the original description in almost every respect.

Bombus parvulus F., described in 1804 (Syst. Piez., p. 352, no. 53), likewise is not a bumblebee. Two specimens are in the Kiel Collection; they belong to the genus *Melipona.*

Bombus virginicus F. In 1804, Fabricius transferred this Linnean species from *Apis* to *Bombus.* The material available for study reveals that what Fabricius probably regarded as this species was, in reality, a composite of at least three species. The report of Schulz (*loc. cit.*) on the matter is both incomplete and misleading. Today, three specimens stand under this name in the Kiel Collection; from left to right, the first is a male of *Xylocopa virginica* (L.), bearing the label "virginica" in Fabricius' handwriting; the second and third specimens are both unlabeled queens, representing *Bombus vagans* Sm. and *B. griseocollis* (De G.) respectively; thus, the name *Bombus virginicus* F. (1804) might be referred to the synonymy of all three of the above species. If, however, proper importance is attached to the first of the three above specimens, the name should be regarded as a strict synonym only of *X. virginica* (L.).

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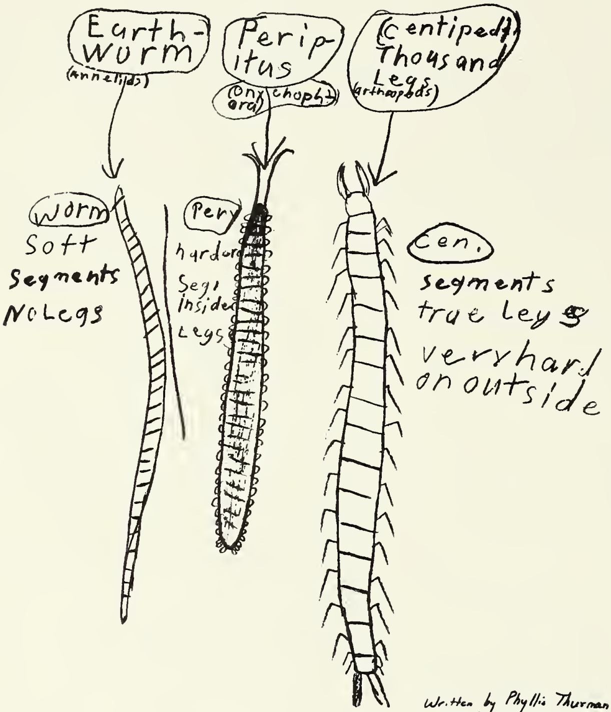
[1] Opinion of Dr. T. B. Mitchell, based on my notes.

ON THE EVOLUTION OF ARTHROPODS?[1]

By Phyllis Thurman


Earth-worm
(annelids)
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(Onychophora)
(Centipede) Thousand Legs
(arthropods)
worm
Soft
Segments
No Legs
Pery
hard or
Seg
inside
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segments
true legs
very hard
on outside

Written by Phyllis Thurman (age 8)
November 15, 1959.
She had seen "Pery" while visiting
in the Snodgrass home. The
following day she presented this
paper to her class, the Fourth Grade
of Bradley Elementary, Bethesda, Md.

Ernestine P. Thurman PhD

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[1] This article is not to be construed as constituting publication in a taxonomic sense, and therefore, any new terms that may have been created inadvertently have no legal standing in zoological nomenclature.

Periptus - Pery - Stroy

~~Pery the Peripitus - [illegible]~~

A live Peripitus lives at Dr. Robert Snodgrass's house ~~from Panama~~. The first live Peripitis Washington has ever had, Pery is the animals nickname. Dr. Phyllis Johnson caught Pery in Panama and sent him to Washington. Dr. Phyllis Johnson is my Godmother.

NOTE ON TWO TACHINID PARASITES OF THE WALKING STICK, *ANISOMORPHA BUPRESTOIDES* (STOLL)[1]

By S. E. Neff and T. Eisner[2]

Over 200 specimens of *A. buprestoides* were obtained, September 9–13, 1959, at the Archbold Biological Station, Highland Co., Florida.[3] They were maintained in our laboratory from September to mid-December. During that period a total of 101 dipterous puparia were recovered from the cages. The two species of tachinid flies that emerged subsequently were identified by Mr. Curtis W. Sabrosky of the Entomology Research Division of the U. S. Department of Agriculture as *Roeseliopsis americana* (Coq.) and *Phasmophora ?antennalis* Town. There are no published records of these two species from *A. buprestoides.*

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[1] The present note is an incidental outcome of work done by Eisner on chemical defensive mechanisms of arthropods, under subsidy of U. S. Public Health Grant E-2908.

[2] Department of Entomology, Cornell University, Ithaca, New York.

[3] We wish to thank Mr. Richard Archbold for many kindnesses extended to us at the Station in connection with this and other studies.

Seventeen *R. americana* adults emerged from a total of seventy puparia; nine *P. ?antennalis* adults were obtained from the remaining thirty-one. Duration of pupal stage in the laboratory ranged from 26 to 30 days in both species.

At least in some instances, the presence of the parasite did not seem to impair the reproductive capacity of the host. Many parasitized females oviposited normally. Moreover, death did not always follow immediately after the mature larva emerged from the host to pupate. This was evidenced by the fact that an increase in the number of puparia in the cages over a two-day period was not necessarily accompanied by an increase in host mortality.

Examination of the parasitized walking sticks revealed up to four openings in the membranous areas between the first, second, and third abdominal terga and sterna. A collapsed chitinous sac was attached to the inner edge of each aperture. Apparently this chitinous sac or envelope is formed by the host and surrounds all but the anterior end of the parasite (Pantel, 1898). It is not known whether these openings represent the original point of entry of the fly larva or are secondary openings made as the larva matures (Pantel, 1910).

The puparium of *P. antennalis* has been described and figured by Greene (1921). Our specimens do not differ materially from his description and figure. However, the lobing of the posterior spiracular plates on some puparia is not as pronounced as in Greene's figure.

The description of the puparium of *R. americana* is new and is as follows: Ovoid (Fig. 1); dark brownish black. Length 8.1–10.5 mm.; width 3.5–4.5 mm. Surface coarsely shagreen with faint transverse ridges encircling segments. Irregular, longitudinal rows of shallow pits dorsolaterally and ventrolaterally. Anterior spiracles not evident; pupal respiratory processes lacking. Cephalopharyngeal skeleton (Fig. 4) about as long as high; mouthhooks (MH) fused anterodorsally, the apex of each hook slightly diverging (Fig. 2); pharyngeal sclerite with distinct reticulate pattern on dorsal cornua (DC). Posterior spiracular plates (Fig. 3) papillose, each papilla bearing minute circular openings; stigmatic scar (button) not evident. No anal plate; anus small, circular. (Based on 20 specimens).

Series of adults of both species with associated puparia have been deposited in the U. S. National Museum.

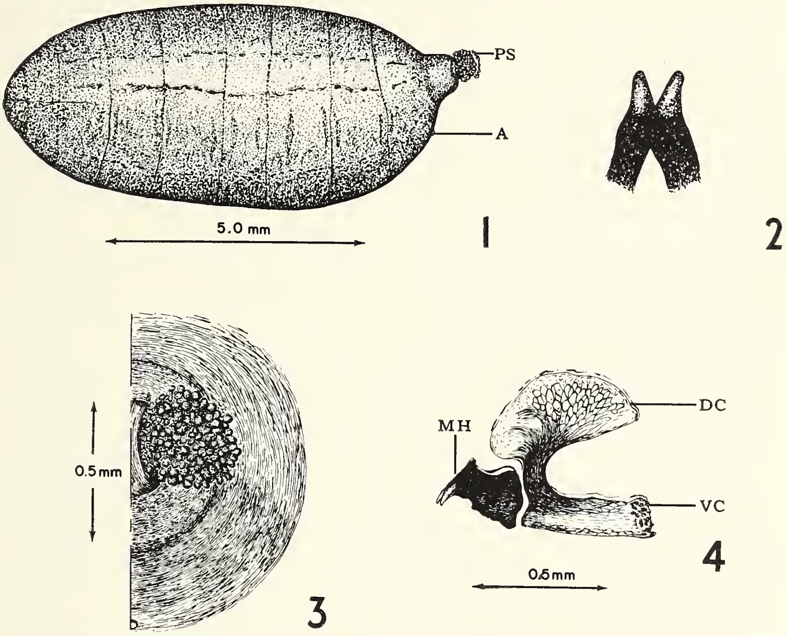

Figure 1, *R. americana,* puparium, lateral view. A—anus; PS—posterior spiracle. Figure 2, *R. americana,* mouthhooks, dorsal view. Figure 3, *R. americana,* puparium, caudal aspect showing right posterior spiracle. Figure 4, *R. americana,* cephalopharyngeal skeleton. DC—dorsal cornua; MH—mouthhooks VC—ventral cornua.

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LIOCORIS, LYGUS AND ETHICS

By Eugene Munroe[1]

Slater (1959) has called attention to the unpublished petition circulated by Usinger and others, and subsequently submitted by Carvalho, Knight and Usinger to the International Commission on Zoological Nomenclature, seeking to change the type species of *Lygus* Hahn, 1833, so as to make that nominal genus a senior subjective synonym of *Liocoris* Fieber, 1858. The object of this proposal was to preserve the use of the name *Lygus* for the taxonomic segregate of the former comprehensive genus *Lygus* that contains species of economic importance in North America, rather than for the segregate that contains the type species as determined according to the Rules, itself a species of economic importance in the Old World. This proposal, as Dr. Slater has pointed out, was supported by a number of prominent hemipterists, and by numerous economic entomologists. The purpose of the present paper is not to discuss the merits of the proposal to the Commission, though these contain points of contention not emphasized by Dr. Slater, but rather to comment on certain aspects of Dr. Slater's paper.

It seems to be characteristic of nomenclatorial discussion (and this principle applies not only in zoology) that it generates increasing heat as the procedural or semantic element increases and as the factual or scientific element decreases. Nomenclature is in fact notorious in a number of fields of science as an area in which high feelings are easily engendered. It therefore behooves us to walk with great caution in areas of nomenclatorial disagreement, for the history of science shows how readily hasty, misconstrued, or quite unintentional implications have in the past led to deep misunderstandings, personal injustices, or in some regrettable cases to private or even institutional animosities of long duration.

Such dire effects are of course not to be foreseen from Dr. Slater's article because of the high personal qualities and the scientific association and friendship of the individuals involved. Nonetheless, certain of the statements made in the article could be interpreted as prejudicial to Dr. L. A. Kelton, and to a lesser degree to certain other scientists of the Canada Department of Agriculture. I am sure this was not Dr. Slater's intention, and that he meant simply to indicate his view as to correct procedure; nonetheless some clarifying comment seems desirable. Because of the personal nature of the involvement, Dr. Kelton has preferred not to make this clarification himself, and, as I took some part in discussion on the *Lygus* petition, and had considerable responsibility for advising Dr. Kelton as to the proper course in his 1955 papers, I have agreed to do it in his stead. In the comments that follow, I have had the advice and agreement of Messrs. G. S. Walley and J. R. Vockeroth, colleagues whom I consulted as specialists in the field of zoological nomenclature.

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[1] Entomology Research Institute, Research Branch, Canada Department of Agriculture, Ottawa.

The passage in Dr. Slater's article that has aroused concern is the second paragraph on p. 98, dealing with the *sub judice* status of the name *Lygus.* In this paragraph Dr. Kelton's name is cited and statements relating to his publications are made in close juxtaposition to statements on ethical procedure in dealing with *sub judice* scientific names. The impression this will make on many readers is that of an attack on Dr. Kelton's scientific ethics, an impression that I trust was not intended by Dr. Slater and that is certainly not justified by the facts.

I may first make the general statement from my personal knowledge that Dr. Kelton's attitude towards the preparation of his papers was in 1955, as at other times, very far from irresponsible or over-individualistic; on the contrary he was almost painfully conscientious; he went to great lengths to consult colleagues and to secure the best advice available to him, on nomenclatorial as well as taxonomic matters. If he made a mistake in procedure it was certainly the result not of a failure in ethics, for no man could have done more to achieve a correct result, but of an error in judgment or interpretation. Such errors are not unknown or inexcusable in the complex and confused nomenclatorial situation that has existed since 1948.

In fact, however, Dr. Kelton in my opinion made no mistake. I believe the action he took was technically and morally correct in view of the circumstances at the time he wrote, and I believe that even now it is at best very doubtful that *Lygus* with *pratensis* as type has protected status by virtue of the Carvalho—Knight—Usinger application being *sub judice.* Criticism of Dr. Kelton's action is possible only by extension of the matter of Bull. Zool. Nomencl. 4: 234–5, I.C.Z.N., 8th Meeting, Paris, Conclusions 4 (3) a and b to questions not covered by their wording and probably not by their intention.

Dr. Slater states that it is "of course" considered "highly objectionable" to "alter the use" of a name that is *"sub judice"* "particularly when there appears to be no opposition to the action requested by the International Commission." He joins this with a reference to the "Code of Ethics discussion", and a page reference to the passage in Bull. Zool. Nomencl. cited in the last paragraph. Comparison of this passage shows that the words given in quotation marks above have been supplied by Dr. Slater and do not appear either literally or in unmistakable substance in the original. There is no mention in that place of "ethics" or "Code of Ethics." These expressions are reserved in the Record of the Paris Meetings for other matters, concerning personal relations between authors (Bull. Zool. Nomencl. 4: 167). The coupling of these strong expressions with practice on pending applications rests on the generally excellent, but individual and quite unofficial, interpretation of Follett (September, 1955), which, incidentally, had not yet appeared when Dr. Kelton submitted his manuscripts. What the original passage in the Bulletin of Zoological Nomenclature does say is, "In such cases neither the worker by whom the error in accepted practice is discovered, nor any other worker should change that practice by substituting some other name for that in common use, until such time as the decision on the future status of the name in question is made known by said Commission" (Conclusion 4 (3) (b)). The words "in such cases" refer to three specific types of cases (Conclusion 4 (3) (a)) involving "a well-known name in common use", viz.:

(1) where such a name is invalid under the law of priority;

(2) where such a name is invalid under the law of homonymy;

(3) where, in the case of a generic name with these attributes of familiarity and usage, the type species of the nominal genus is a species not commonly accepted as referable to the genus in question or to a segregate thereof.

Neither the law of priority nor the law of homonymy is involved directly in the present case, which therefore is not of the types (1) or (2). Also it is of a kind specifically and apparently deliberately excluded from type (3), for *Lygus pabulinus,* the type species under the International Rules, is indeed commonly accepted as referable to a segregate of the genus in question.

This is a real distinction, and no technical quibble. The present case is not one in which a well-known name is being suppressed for purely nomenclatorial reasons, but rather one in which restriction of the application of a name is in any event necessitated by a change in taxonomic concepts, and in which it proposed to suspend the normal procedure for such restriction because of the weight of North American literature in economic entomology.[2] It is not even a pure case of economic versus taxonomic literature, for a considerable body of economic literature relating to *Lygus pabulinus* will be disturbed if the Carvalho—Knight—Usinger petition is granted. These comments are offered here not as criticism of the petition, but to show that it must be viewed as a special case, and not as an example of the superfluous and purely formal type of name change that Conclusion 4 (3) was designed to prevent.

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[2] Much of this refers to *"Lygus pratensis L."* a species which actually does not occur in North America.

The wording of Conclusion 4 (3) seems to make it irrelevant whether or not the Carvalho—Knight—Usinger petition was actually *"sub judice"* at the time Dr. Kelton's articles, as under that conclusion the onus if it exists at all begins at the time of discovery of the condition requiring remedy, and not at the time of submission of the petition. However, as a matter of record, although a draft petition had been circulated to Dr. Kelton and others in 1954, and I had personal discussions with Dr. Usinger on this subject at Berkeley in January, 1955, it was not known to Dr. Kelton or myself in early 1955, when his manuscripts were in final preparation, whether the petition would be proceeded with, or whether it would be withdrawn or modified because of objections raised to it. Dr. Kelton had some reason to believe he would be notified if the petition was to be forwarded; no such notification had then been received. In the absence of a submitted petition, of a clear-cut indication that the petition would be submitted, and of warrant under the Rules for prejudging the case, Dr. Kelton, with my concurrence, felt he should follow the course that appeared to be laid down by the Rules. In order to minimize any harm that might result from this decision, he inserted in each of his 1955 papers, not merely in the third, cited by Dr. Slater, a concise statement of the nomenclatorial effects if the Carvalho—Knight—Usinger proposal should be accepted. This statement is therefore available to all persons using Dr. Kelton's papers. All these papers were submitted for publication and were proof-read, and all but the last were actually published, before the submission of the Carvalho—Knight—Usinger proposal to the International Commission, on December 9, 1955.

In further amplification it may be noted that the wording adopted by the London Congress in 1958 (Draft, the International Code of Zoological Nomenclature as Amended to 1958, Article 18 (4) (i)) is more general. The new wording may conceivably be construed to give protected status to *Lygus* with a changed type species, though even under the new regulation the interpretation appears open to doubt. There is again no mention of "ethics" or associated phrases in the new wording, although a rule is laid down, violation of which is of course open to the same objection as other violations of the Rules.

However the new Rules do not take effect until the date of their publication (Draft, Article 19 (3)).[3] Until then we are bound by the words of the old Rules, under which the correct action appears to be to use *Liocoris* for the *pratensis* group and *Lygus* for the *pabulinus* group of *Lygus, sensu lato.* Eminent zoologists have often in the past chosen to ignore one provision or another of the Rules, sometimes with good effect. I do not therefore, make the categorical statement that the advice given by Dr. Slater in his concluding paragraph is wrong. This is a question that each zoologist must decide according to his conscience. However, at least until the appearance of the new Rules, those deciding to use *Lygus* for *pratensis* and allies should do so in the knowledge that they are contravening the existing Rules, and not under the mistaken impression that they are following them.

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[3] Probably to appear as Section XVII Article 80 in the published International Code, according to information recently received.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. LV DECEMBER, 1960 No. 5

A GYNANDROMORPHIC SPECIMEN OF *PSITHYRUS FERNALDAE* FKLN. (HYMENOPTERA: APIDAE)

By H. E. Milliron, Glen Dale, West Virginia

The first known gynandromorphic bumblebee of the genus *Bombus* was a specimen of *lapidarius* (L.) reported by Sichel in 1858. Since then, five additional individuals have been recorded as follows: One of *mastrucatus* Gerst. by Ritsema (1881), and another of the same species by Stöckhert (1924); one of *pratorum* (L.) by Frey-Gessner (1898); another of *lapidarius* by Stöckhert (1920); and, one of *ruderarius* Müll. also by Stöckhert (1924). Certain details are absent from nearly all of these reports so that it is impossible to make close morphological comparisons. Some represent the incomplete lateral type, others are mosaics, and at least one (*lapidarius* of Stöckhert) is of the frontal type. The rarity of gynandromorphs in this large group of social bees, which has been studied intensively for many years, is apparent by the small number (six)[1] of such cases that has been recognized throughout the world during the past century. None has been known, heretofore, for any species of the genus *Psithyrus*, the inquiline bumblebees.

The interesting specimen reported herein (Figure 1) was captured on August 5, 1960, by the writer on *Solidago* sp. at about 4,000 feet altitude on the way to the summit of Spruce Knob in Pendleton County, West Virginia. It represents the frontal type, having a head that resembles the female, a thorax (including appendages) of the same sex, and an abdomen that is completely male except for some female parts in the genito-anal chamber.

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[1] This does not include W. B. R. Laidlow's 1932 report (Scot. Nat., p. 25) of a male *B. agrorum* (F.) with only the left side of the head being female.

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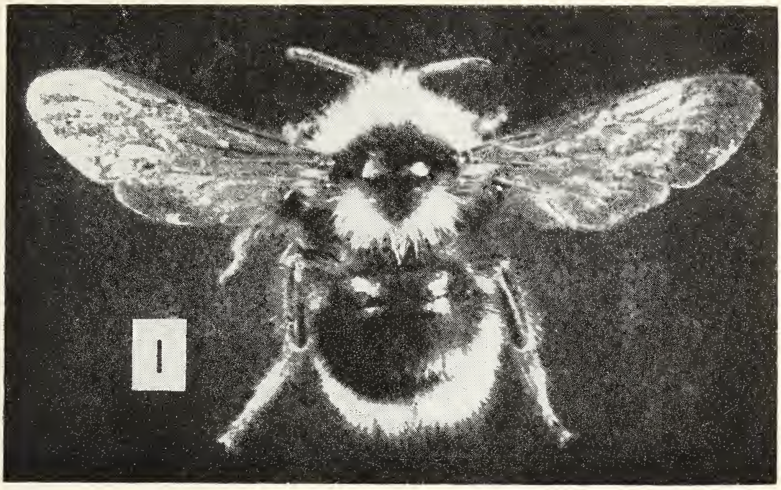
Description of Gynandromorphic P. fernaldae (Fig. 1)

Dimensions: Body length 14.5 mm. (head and thorax 7.0 mm., abdomen 7.5 mm.); thoracic width at tegulae 6.0 mm.; abdominal width at tergum two 6.5 mm.; length of front wing 13.5 mm. (greatest width 4.7 mm.); length of hind wing 9.0 mm. (greatest width 2.5 mm.). *Head:* Differs from that of a normal female in being proportionately smaller, with narrower compound eyes, a slightly more convex vertex with stronger punctation, and a clypeus that is narrower, more convex and densely punctate. The labrum lacks distinct tubercles and shelf, and is midway between female and male. The mandibles are like those of a female, except that they are more heavily bearded. The pubescence on the clypeus and face is characteristically male. In all other respects, the head (including the antennae) has the appearance of the female. *Thorax:* Including the legs, like that of a small female; little difference exists between the wings in both sexes. *Abdomen:* The external structure is entirely male, with seven exposed terga and six visible sterna (no reference is made to the small morphological first sternum). *Coloration:* The color of the pubescence on the head and thorax is like that of the female, except for the conspicuous yellow tuft above the antennal bases and the distinct black area between the wing bases that are usually more obvious in the opposite sex. The color of the abdomen above, and beyond tergum one (morphological second), is interesting in that it shows two common forms found in the male; the right half of tergum two is predominantly yellow with an admixture of black, especially basally, while the same part of tergum three is all yellow; whereas, the left halves of the corresponding terga are black, except for some yellow lateroposteriorly on tergum three. The coloration not mentioned for the remaining abdominal terga, and that for the abdominal venter, is as found on the typical male.

Explanation of Plate

Fig. 1. Gynandromorphic specimen of *P. fernaldae;* abdominal dorsum shows two distinct color forms common in the male. (Photo by R. M. Fox, Carnegie Museum, Pittsburgh, Pa.)
Fig. 2. Ventral aspect of gynandromorphic *P. fernaldae* genitalia and ninth abdominal sternum; F—furcula, R—ramus of right second valvula, 9S—ninth abdominal sternum, ST—stylus, 2VL—right second valvifer, 2V—second valvulae.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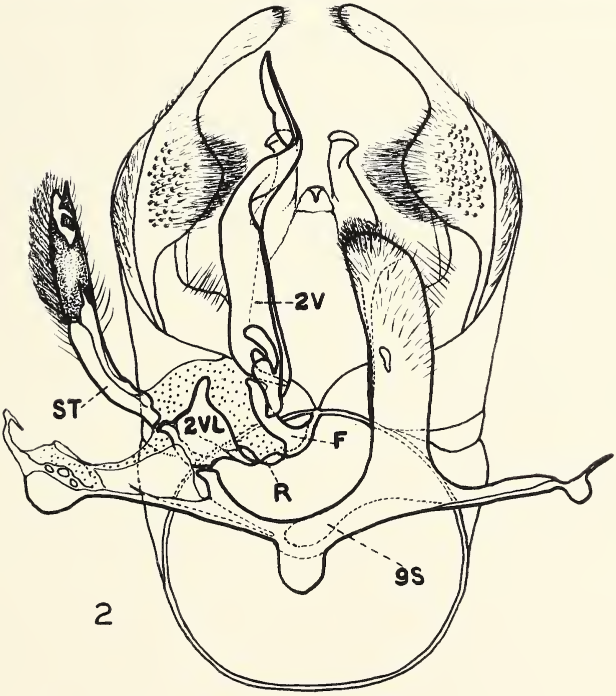
2V
ST
2VL
F
R
9S
2

DESCRIPTION AND COMMENTS ON THE GENITALIA (Fig. 2)

Numbers associated with abdominal segments discussed beyond are in accord with current morphological interpretation. Most of the parts that comprise the dorsal and lateral confines of the genito-anal chamber (*i.e.,* the membranous and weakly sclerotized portions of terga eight and nine, and the proctiger), as well as sternum eight, are usual in every respect. Sternum nine (9S), normally bilaterally symmetrical, is deformed on the right side and bears little resemblance to the left side which approaches the usual form. The chamber contained complete and apparently functional male genitalia (to which no further anatomical reference is made), as well as an incomplete, deformed and partly displaced female genitalia ventrally on the right side. It should be noted that the misshapened furcula (F) is inseparably attached to the base of the male genitalia midventrally (complete dissection of that part, which was not attempted, would have resulted in serious breakage). There is no apparent evidence of the presence of first valvulae; the second valvulae (2V) are nearly complete but much distorted.

The ramus (R) of the right second valvula appears to have been secondarily attached to a part of the furcula. The right second valvifer (2VL) is small, much distorted and attached, by a weak ligament, to a posteriorly directed strut from the baso-lateral extension of the ninth sternum. The stylus (ST), borne by the second valvifer, is interesting and the following should be noted: (1) size about normal; (2) vestiture normal in amount, most being characteristically plumose; (3) shape abnormal, i.e., cylindrical and not longitudinally concave along its mesal, or ventral surface as on a normal female; and, (4) segmentation indicated.

As far as the genitalia of this *fernaldae* specimen are concerned, apparently they are like those associated with the specimen of *Bombus mastrucatus,* to which only brief mention was made by Stöckhert (1924). They might also be compared to those detailed for *Andrena agilissima* Scop. by Popov (1935), except in that case the condition is reversed, there being the complete genitalia of the female and only about half (right) of a non-functional male organ. However, the present specimen is so constructed as to be more suggestive of the homologies and of the derivation of male and female genital parts than that described by Popov; and, it seems to me, the supernumerary nature of these female parts described here should not necessarily disqualify them or nullify their value for comparative purpose. The unusual form of the right side of the ninth sternum indicates that this sternum was affected by, or took part in, the formation of the female organ. In my specimen, there are two principal points of interest: (1) the close connection of the second valvulae with the base of the male genitalia, and the attachment of the second valvifer to the ninth sternum support the established contention that these parts are derivatives of the ninth segment; and, (2) the stylus bears evidence of segmentation, suggesting that it should be regarded as a homologue, at least in part, of the outer clasper in the male.

The above specimen and its extracted parts are in the writer's personal collection.

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UNDESCRIBED SPECIES OF NEMATOCEROUS DIPTERA. PART IX[1]

By Charles P. Alexander, Amherst, Mass.

The preceding part under this general title appeared in December 1959 (Bul. Brooklyn Ent. Soc. 54: 129–135). The species treated herewith are from Sikkim, in the eastern Himalayas of India, where they were collected in 1959 by Dr. Fernand Schmid. I am very deeply indebted to Dr. Schmid for the privilege of studying these exceptionally interesting flies, the types of which are preserved in my personal collection.

TANYDERIDAE

Protanyderus sikkimensis, n. sp.

Size medium (wing of male 10 mm.); general coloration of mesonotal praescutum brownish yellow, patterned with brownish gray; legs yellow, the tips of the femora weakly infuscated; wings subhyaline with a medium brown crossbanded pattern, the dark areas narrowly bordered by darker, the interspaces broader than the darkened bands; basal darkening not connected with the central area along vein *Cu;* male hypopygium with the spine of the dististyle acute at tip.

Male: Length about 10 mm.; wing 10 mm.

Female: Length about 11 mm.; wing 13 mm.

Rostrum brown, palpi and mouthparts black. Antennae short, black throughout; pedicel very large, flagellar segments subcylindrical, much shorter than the verticils. Head brownish gray.

Cervical sclerites and pronotum dark brown. Mesonotal praescutum with the ground brownish yellow, with four confluent brownish gray stripes, the narrow interspaces with yellow setae from darkened punctures; median region of scutum and the scutellum brownish yellow, the latter slightly darkened medially, postnotum grayish brown. Pleura and pleurotergite chiefly yellowish brown. Halteres with stem yellow, knob dark brown. Legs with coxae and trochanters brownish yellow; femora yellow, tips weakly infuscated; tibiae and tarsi uniformly yellow, the last tarsal segment a little darker. Wings subhyaline, with a medium brown crossbanded pattern, the dark areas narrower than the interspaces, pale brown, narrowly but conspicuously margined with darker, paler than in *schmidi;* a dark area at arculus, widely separated from the second band at origin of *Rs,* the two confluent behind across the bases of the Anal cells; third band largest, expanded along costa, narrowed behind, reaching the posterior border at veins *Cu* and *A,* not connected along vein *Cu* with the first band, as in *schmidi;* the narrower outer band occupies the cord, broadest at costa, reaching the posterior border at veins M_3 and M_4, in the outer radial field sending a branch to the wing tip; ground interspaces more extensive than in *schmidi;* cell *C* variegated with dark and pale areas, in the male cell *Sc* similarly patterned; space between the branches of *Cu* pale with a series of brownish black spots, this area uniformly darkened in *schmidi;* veins yellow, a trifle darker in the patterned areas. Venation: Basal section of R_5 very short.

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[1] Contribution from the Entomological Laboratory, University of Massachusetts.

Abdomen yellowish brown, tergites freckled with darker brown setigerous punctures, sternites less evidently patterned. Male hypopygium with the posterior border of the tergite with a broad V-shaped notch. Dististyle relatively long and slender, not conspicously expanded opposite the base of its lateral spine, this acute at tip; apex of style with numerous setae.

Habitat: Sikkim. *Holotype:* ♂, Ramtang, 5780 feet, October 13, 1959 (Fernand Schmid). *Allotopotype:* ♀.

The types were found at night beneath stones along the bank of a mountain torrent, associated with a second species of the genus, *Protanyderus venustipes,* n. sp.

Protanyderus sikkimensis is quite distinct from the other Himalayan members of the genus, all differing among themselves in the pattern of the legs and especially of the wings. The occurrence in a single place of two distinct species of *Protanyderus,* as discussed above, might seem to indicate the possibility of a more extensive fauna of Tanyderid flies in the Indo-Chinese Region.

Protanyderus venustipes, n. sp.

Size medium (wing of female over 13 mm.); general coloration of thorax dark brown; legs handsomely patterned, femora black, tibiae and tarsi yellow, the ends blackened; wings whitened, with a very conspicuous dark brown pattern, the general appearance being of a darkened wing with eight white areas, the two basal ones small; male hypopygium with the lateral spine of the dististyle slender.

Male: Length about 11 mm.; wing 9.5 mm.; antenna about 1.5 mm.

Female: Length about 10–11 mm.; wing 13.5–14 mm.; antenna about 1.6 mm.

Rostrum, mouthparts and palpi black. Antennae relatively short, black throughout; flagellar segments subcylindrical, much shorter than the longest verticils, with a dense white pubescence. Head dark gray, the posterior vertex darker medially.

Cervical region and pronotum brownish black, brown laterally. Mesonotal praescutum and scutum dark brown, with a slightly darker faintly impressed median line; scutellum dark brown, paler basally; postnotum and pleura dark brown. Halteres with stem light yellow, knob blackened. Legs with coxae and trochanters black, weakly pruinose; femora black; tibiae light yellow, the base blackened, the tip more broadly so, about equal to one-fourth or one-fifth the yellow part; basitarsus light yellow, the extreme base vaguely darkened, outer fifth blackened, remainder of tarsi black. Wings with the ground whitened, with a very conspicuous dark brown pattern including three oblique crossbands, all interconnected so that the dark color in places extends from the wing base to the apex; the general appearance is of a darkened wing with eight white areas, two small basal ones postarcular, the others much larger, including an oval area before cord in cells *R* and *M*, a larger one caudad of this in cells *Cu* and *A*; smaller areas in outer radial field before the fork and at the wing tip; the largest area lies beyond the cord, extending from the posterior border of cell R_5 to the margin in cell M_4; the remaining white marking occupies the wing tip in the medial field; cell *C* with alternating white and brown lines, in cases the dark color very heavy; cell R_4 uniformly darkened or virtually so; in the allotype, cells of posterior half of wing with paler centers; axillary area basad of the arculus light yellow; veins light yellow in the ground, light brown in the darkened parts. Venation: Veins M_4 and Cu_1 widely divergent, cell M_4 at margin extensive.

Abdomen dark brown, without evident frecklings. Male hypopygium with the tergite narrowed posteriorly, the border with a V-shaped notch. Dististyle with the lateral spine more slender than in *sikkimensis*, the outer end of style shorter, with longer setae.

Habitat: Sikkim. *Holotype:* ♂, Ramtang, 5780 feet, October 13, 1959 (Fernand Schmid). *Allotopotype:* ♀. *Paratopotypes:* 2 ♀♀. At night beneath stones on bank of a mountain torrent, associated with *Protanyderus sikkimensis*, n. sp.

Protanyderus venustipes is readily told from the other Himalayan species, *P. schmidi* Alexander and *P. sikkimensis*, n. sp., by the distinctive pattern of the legs and wings.

TRICHOCERIDAE

Paracladura superbiens, n. sp.

Size large (wing of female over 5.5 mm.); general coloration dark brown; wings pale yellow, conspicuously patterned with brown, including a broad band at cord and seams over the outer veins from R_5 to M_4 inclusive; R_{2+3+4} relatively short, from one-half to three-fifths R_{2+3}.

Male: Length about 5 mm.; wing 6–7 mm.

Female: Length about 4–6 mm.; wing 5.6–8 mm.; antenna about 3–4 mm.

Rostrum brown, mouthparts paler; palpi black. Antennae shorter than the body; scape and pedicel light yellow, flagellum black, the outer segments paler. Head brownish gray.

Pronotal scutum dark brown, scutellum paler brown. Mesonotum chiefly dark brown, the praescutum on sides before suture and the parascutella paler. Pleura dark brown, paler behind. Halteres with stem yellow, knob black. Legs with coxae brownish yellow, fore pair darker; trochanters testaceus yellow; femora brown, bases somewhat paler; tibiae and tarsi darker brown. Wings of type pale yellow, conspicuously patterned with brown, including a broad band at cord, extending from costa to end of vein *Cu*, slightly interrupted on vein M_{3+4}; other darkenings on veins R_5 to M_4 inclusive; a broad seam in cell *Cu* behind vein Cu_2, including more than one-half the length of the cell; cell *2nd A* darkened; veins yellow, conspicuously darker in the patterned areas. In some paratype specimens wings less heavily patterned, with virtually the only darkening being the band over the cord. Costal and Anal fringes long; macrotrichia on longitudinal veins beyond arculus, longer on veins beyond cord, very small nearer the arculus, on *2nd A* with two or more at near midlength of the vein. Venation: R_{2+3+4} about one-half to three-fifths R_{2+3}; *m-cu* on M_4, in cases to nearly its own length; cell *2nd A* narrow.

Abdominal tergites dark brown, sternites with the posterior borders paler. Ovipositor with the cerci long-triangular. Male hypopygium with the dististyles simple. Phallosome with paired dark-colored central rods and small slender simple gonapophyses.

Habitat: Sikkim. *Holotype:* ♀, Yagtang, 11,200 feet, in *Rhododendron* association, May 28, 1959 (Fernand Schmid). *Allotype:* ♂, Tangshing, 12,200 feet, in *Rhododendron* association, October 5, 1959. *Paratopotypes:* 4 ♀♀. *Paratypes:* 1 ♀, 2 ♂♂, with the allotype.

Paracladura superbiens is quite distinct from *P. elegans* Brunetti, the only other regional species of the genus having patterned wings. It is the largest species of *Paracladura* so far discovered, rivalling in size the medium-sized members of the genus *Trichocera.*

Trichocera auripennis, n. sp.

General coloration black; legs black, femoral bases yellow; wings brownish yellow beyond the cord, the base clear light yellow; *Rs* and most veins beyond the cord conspicuously seamed with brown.

Female: Length about 7 mm.; wing 9.3 mm.; antenna about 4 mm.

Rostrum and palpi black, terminal segment of the latter about one-half longer than the penultimate. Antennae relatively long, brownish black, outer flagellar segments paler; first flagellar segment a trifle longer than the second, the latter subequal to segments three to six, succeeding segments becoming much longer and attenuated. Head black.

Thorax uniformly black, surface subnitidous; praescutum with sparse setae, two above the humeri much longer. Halteres yellowed, the apex of knob destroyed by pests. Legs with coxae black; trochanters brownish black; remainder of legs black, the femoral bases yellowed, on the fore and hind pairs including about the proximal sixth, on the mid femora nearly the proximal third. Wings brownish yellow beyond the cord, the base, especially the prearcular and costal fields, clear light yellow; *Rs,* outer third of *M* and the veins at and beyond the cord seamed with brown, least so on R_{1+2}, R_3 and R_4, very heavy on cord and outer end of cell *1st* M_2; veins in the infuscated parts dark brown, in the brightened fields clear yellow, including *C, Sc, R,* Cu_1, Cu_2, *2nd A* and the narrow bases of *M* and *1st A.* Macrotrichia of veins relatively short, lacking on *2nd A,* base of *Sc* and proximal third of *M* and *1st A.* Venation: Sc_1 ending just beyond R_2, Sc_2 about opposite one-third to one-fourth the long *Rs;* R_{2+3+4} straight, nearly twice as long as the elevated R_{2+3}; inner end of cell *1st* M_2 pointed; cell M_1 about one-third longer than its petiole; *m-cu* shortly before the fork of M_{3+4}; cell *2nd A* wide; a faint yellow supplementary vein behind vein *1st A,* in appearance somewhat similar to Cu_2.

Abdomen uniformly black. Ovipositor yellowish brown; cerci relatively stout, outer half narrowed and strongly decurved to the acute tips.

Habitat: Sikkim. *Holotype:* ♀, Tangshing, 14,100 feet, in *Rhododendron* association, October 6, 1959 (Fernand Schmid).

Trichocera auripennis is entirely distinct from all other species in the yellow wings, especially striking on the proximal half. Attention is called to the supplementary vein behind *1st A* which here is better indicated than in most species of the genus.

Trichocera thaumastopyga, n. sp.

Size medium to large (wing generally about 10 mm.) ; general coloration black, surface dull; halteres and legs black; wings broad, whitened, with an abundant dotted pale brownish gray pattern, including spots in cells excepting *C, Sc, 1st* M_2 and *2nd A;* ovipositor with cerci long-oval; male hypopygium complex in structure, the sixth and seventh tergites modified into a tenaculum for holding it.

Male: Length about 6.5–8 mm.; wing 7.5–10 mm.; antenna about 4–4.5 mm.

Female: Length about 8–8.2 mm.; wing 10.5–11 mm.; antenna about 5 mm.

Rostrum dark gray with long porrect setae; palpi short, black; mouthparts projecting as flattened blades. Antennae long, black, apex of pedicel narrowly paler; first flagellar segment about one-half longer than the second; segments with short dense pale pubescence. Head dark brownish gray; vertical tubercle large, rounded, the lateral ocelli on its sides; posterior vertex and occiput more depressed; sides of posterior vertex with long coarse setae.

Thorax black, the surface appearing dull by a slight gray pruinosity, intermediate praescutal stripes slightly indicated, the lateral pair less so; praescutal setae sparse but long, especially the anterior ones; scutal setae long, upcurved. Halteres brownish black. Legs with coxae and trochanters black; remainder of legs black, the bases of the fore femora very narrowly and vaguely paler; middle and hind basitarsi with erect spinoid setae additional to the normal vestiture. Wings broad, ground whitened, with a very abundant pale gray dotted pattern, the spots occurring in all cells excepting *C, Sc, 1st* M_2 *and 2nd A;* spots circular in outline, tending to become confluent, averaging about six or seven in cells R_4, R_5, *Cu* and *1st A,* somewhat fewer in other cells; in cases, two or three darkened spots in the costal cell; veins slender, brownish black. Macrotrichia of veins small but abundant, lacking on most of *Sc* basad of Sc_2, *M* and *2nd A; Rs* and *1st A* without trichia on about the proximal third. Venation: Sc_1 ending just before R_2, Sc_2 about opposite one-third the length of *Rs;* R_{2+3+4} about one-half R_{2+3}; cell M_1 nearly twice its petiole; cell *1st* M_2 pointed at inner end; *m-cu* before the fork of M_{3+4}; cell *2nd A* moderately broad.

Abdomen dull black, including the male hypopygium; genitalia of female brown. Ovipositor with the cerci long-oval, narrowed to the blunt tip; hypovalvae stout basally, decurved and narrowed outwardly, tips truncate. Male with the sixth tergite on either side of the midline with about 25 very strong black spinous bristles that are directed caudad, lacking on the mid-region; seventh tergite with a small median sclerotized Y-shaped rod directed caudad; these structures form a tenaculum for holding the recurved male hypopygium. Hypopygium complex; basistyle with the inner face produced mesad into a large flattened subtriangular blade, its outer part with delicate setae, near base farther produced into a more slender flattened arm, more or less cultrate in outline. Dististyle slightly curved on basal half, the outer end dilated into a head, farther produced into a long black spine, the head with an outer lobule bearing several very long bristles; base of head cephalad of the spine with numerous more crowded bristles. Gonapophyses appearing as flattened blades, narrowed to acute tips.

Habitat: Sikkim. *Holotype:* ♂, Tangshing, 14,100 feet, in *Rhododendron* association, October 6, 1959 (Fernand Schmid). *Allotopotype:* ♀. *Paratopotype:* 1 ♀; *paratype:* ♂, Lachmi Pokri, in *Rhododendron* association, 14,000 feet, October 11, 1959.

Trichocera thaumastopyga is unquestionably the most remarkable species of the genus so far discovered. Not only is the male hypopygium unusually complex in structure, but the modified sixth and seventh tergites forming a tenaculum for the hypopygium in a position of rest is unique in the family. The ovipositor likewise is aberrant in structure. The paratype is smaller than the type but undoubtedly is conspecific. Superficially the fly most resembles species such as *T. punctipennis* Brunetti (*versicolor* Loew) or *T. reticulata* Alexander, all having the hypopygium unmodified. Species of *Trichocera* having complex male hypopygia now include the Eurasian *T. forcipula* Nielsen, *T. lutea* Becher, *T. mirabilis* Alexander, *T. schmidi* Alexander and *T. stecki* Bangerter, and the North American *T. colei* Alexander, *T. salmani* Alexander and *T. ursa-major* Alexander.

A NEW NUEVOBIUS, WITH REVIEW OF THE GENUS* (CHILOPODA: LITHOBIOMORPHA: LITHOBIIDAE)

By R. E. Crabill, Jr.[1]

The lithobiid genus *Nuevobius* was proposed by R. V. Chamberlin in 1941 for the reception of a single new species, *cavicolens*, which had been collected within a cave in the northeastern Mexican State of Nuevo Leon. The long, slender legs and extraordinarily long, multisegmental antennae of the typical specimen appear to reflect a habitus common to many cave-dwelling chilopods, including members of each of the four orders. Indeed, the possession of elongate appendages seems to be manifest in many different kinds of cavernicolous arthropods, so that one might suppose that the phenomenon reflects a form of adaptation imposed or facilitated by life in caves.

The Chamberlin genus is of particular interest for at least two other reasons. First, it bears a distinct resemblance to *Sozibius*, whose species are very commonly encountered in the midwestern and southeastern United States. In this regard, Chamberlin himself admitted that maintaining the separate generic identities of *Nuevobius* and *Sozibius* might eventually prove to be untenable. It is true enough that *Nuevobius* seems to represent a special variant of the rather distinctive *Sozibius* pattern. However, the supraspecific structure of the whole complex to which both are referable is presently so poorly understood that a meaningful realignment at the generic level would be impossible at that time.

I should also like to alert the reader to the existence of a third important generic entity which manifests subtle but, I believe, convincing evidence of being closely akin to the foregoing genera. I refer to the widespread southeastern and midwestern genus *Neolithobius* (*sensu* Chamberlin), which appears to me to represent a kind of precursive *Sozibius*. If we discount the tergital productions, which are not actually so meaningful for generic characterization as we once believed them to be (Crabill and Lorenzo, 1957, p. 431), we are left with a group of characters which individually and as a group clearly imply fairly close kinship with the other two genera. Aspects of these relationships are explored in more detail

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* This study was undertaken with the aid of a grant from the National Science Foundation.

[1] U. S. National Museum, Smithsonian Institution, Washington, D. C.

in the concluding section of this paper.

Finally, *Nuevobius* may now be shown to have an heretofore unsuspected distributional significance, inasmuch as the second species of the genus, here proposed as new, was recently collected in a cave in southern Tennessee.

This interesting example of apparent distributional discontinuity is reminiscent of the parallel case of *Nyctunguis pholeter* Crabill, a schendylid that was also discovered in a Tennessee cave (Crabill, 1958, p. 154). As is true of the new *Nuevobius,* the affinities of *pholeter* seem to be with the far Southwest. Perhaps it is significant that *Nyctunguis,* which is represented by a number of species in Mexico and in the far western United States, is without known representation in the central Continent, while in the East it is known from a single species, a cavernicole. Both cases seem to lend support to the idea that faunal connections linking the North American Southeast with the Southwest and with lands to the south were once more pronounced than they are today. Possibly the post-Pliocene topographic and related climatic changes of the continent impoverished or interrupted many existing faunal continua, with the result that certain groups in the East were able to survive only sporadically, under particularly suitable conditions, such as those that caves offered.

Nuevobius cottus,[1] n. sp.

Sharing the distinctive criteria that signalize their genus, *cottus* and *cavicolens* obviously differ in many important respects. These are listed below: those believed to have particular diagnostic value are preceded by an asterisk.

Nuevobius cavicolens: (1) Tergites 11 and 13 "well produced". (2) Color amber yellow. (3) 15th leg pretarsus without accessory claws. *(4) 14th leg pretarsus without accessory claws. *(5) 15D = 10310; 14D = 10311. *(6) Spur series VPM beginning on first leg.

Nuevobius cottus: (1) Tergites 11 and 13 very weakly produced. (2) Color predominantly reddish-brown and dilute. (3) 15th leg pretarsus with a minute (setiform) accessory claw. *(4) 14th leg pretarsus with a prominent setiform and a large unguiform accessory claw. *(5) 15D = 10321, i.e. series DFA and DTiP continuing posteriorly to and occur on leg 15 (both stopping short of 15 in *cavicolens*) ; 14D = 10322, i.e. DFA and DTiA present on 14 in

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[1] In allusion to Cottus, one of the trio of "hundred-handed" monsters slain by Hercules.

cottus, absent on 14 in *cavicolens.* *(6) Spur series VPM beginning posterior to legs of midbody; in *cavicolens* VPM beginning on leg 1.

Holotype ♂.—Tennessee: Blount County, Tuckaleechee Caverns, near Townsend, April 18, 1959 (Thomas C. and Catherine Barr). U.S. N.M. Myriapod Catalogue Number 2673; Myriapod Collection Number 148.

Introductory.—Length, 23 mm. Color: Tergites dilute reddish-brown, their margins somewhat darker, the underlying musculature discernible; cephalic plate deep red-brown, opaque; legs very pale red-brown on outer surfaces, inner surfaces shading to hyaline, the underlying musculature plainly discernible.

Antennae.—Each about 18 mm. long; when pulled posteriorly, reaching the end of the 10th tergite, thus well exceeding midbody length. Each with 42 articles; the articles of the proximal two-thirds notably elongate, each much longer than wide. The first 3–4 articles sparsely clothed with longer setae, thereafter the setae increasing in density and decreasing in length.

Cephalic plate—(Fig. 2.).—Greatest length, 2.7 mm., greatest width, 3.0 mm., thus somewhat wider than long. The limbus (Note A) posterocentrally distinctly procurved and wider and higher than elsewhere; laterally distinctly disjunct; anterior to disjuncture limbus is narrow and lower but continuous to ocellar area. Head surface very smooth, lustrous; setae sparse, long. Frontal and antennocellar sutures (Note B) pronounced, interconnecting, complete.

Ocellar area—(Fig. 2a).—With prominent, multiseriate ocelli disposed in some five irregular horizontal rows, e.g., from bottom to top approximately, 1 + 56655. Ocelli of upper two rows ovate, larger than those below; those of lower series subovate to subcircular, their rows very poorly defined. The major ocellus (Note C) distinctly separated from the minor ocelli, most widely from those of the lower 4 series, and distinctly much larger than the largest of the minor ocelli. Organ of Tömösvary situated in the lower anterior corner of the ocellar area; well separated from all minor ocelli, small in size, not larger than the nearest minor ocellus, subcircular in shape.

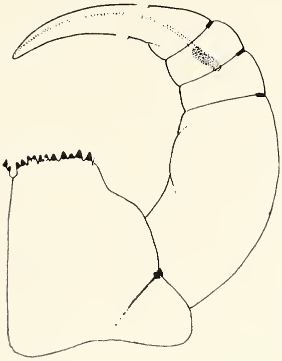
Prehensorial segment.—(Figs. 1, 3).—Prosternal dentition, right 9, left 11, the teeth relatively long and acute; central diastema distinctly U-shaped, narrow; porodonts lateral and very slightly ventral to their respective dental rows, delicate, very fine, distinctly thinner than neighboring setae. Prehensors relatively thin and long, their ungulae notably so; approximately the apical third of each ungula is curved somewhat posteriorly.

Tergites.—The 11th and 13th weakly but distinctly produced; the productions of the 11th very slight, those of the 13th more pronounced; the 9th tergite without discernible productions. Each tergite with complete, raised lateral margins, these margins becoming higher and more prominent on the more posterior tergites of the body, particularly on the 10th, 12th, and 14th. Rear margins of the 14th and 16th tergites subtruncate. The following tergites distinctly wider than long: 1,2,4,6,9,11,13,15. The following tergites distinctly longer than wide: 3,5,8,10,12,14,16. The 7th tergite only slightly wider than long; the 15th concealed beneath the 14th and nearly vestigial, but its discrete, flanking catapleurites well-developed. First tergite lustrous, those following becoming successively more roughened, the more posterior tergites very weakly papulate.

EXPLANATION OF PLATE

Figs. 1–4, 6, Holotype, *Nuevobius cottus,* n. sp. Fig. 5, *Sozibius tuobukus* (Chamberlin) from Russellville, Tennessee, one of the localities from which the original series of the species was drawn. Fig. 1, Left side of prosternum, with left prehensor *in situ.* (Ventral aspect; setae deleted). Poison calyx with emergent poison canal shown in stipples. Fig. 2, Left side of cephalic plate. (Dorsal aspect; setae deleted). a——ocellar area, b——major ocellus, c——posterior portion of antennocellar suture, d——frontal or transverse suture, its left end meeting the antennocellar suture, e——extension of the limbus anterior to the disjuncture, f——disjuncture of the limbus, g——posterior, raised portion of the limbus. Fig. 3, Extreme left end of the prosternal denture. (Ventral aspect; all setae shown). Porodont shown to the viewer's lower right left of outermost tooth. Fig. 4, Left ultimate leg. (Inner surfaces shown, the dorsal side rotated very slightly away from the observer; setae deleted). Dense porosity of distoprefemoral articles represented in stipples. a——densely porous (cribrose) inner surface of femur, b——nearly poreless ventral surface, c——spur VFM, its tip approximately trident, d——spur VFP, its tip plain, not trident, e——spur DFP, its tip approximately trident, f——greatest length of cephalic plate, showing extraordinary length of rear leg. Fig. 5, Tarsus of 12th leg, *S. tuobukus.* (Inner surface; setae deleted). Note conspicuous tarsal division and relative lengths of tarsal articles. Cf. Fig. 6. Fig. 6, Tarsus of 12th leg, *N. cottus.* (Inner surface; setae deleted). a——proximotarsus, b——tarsal division, a true dorsal condyle absent, c——distitarsus, d——inner (unguiform) accessory claw of pretarsus.

CRABILL



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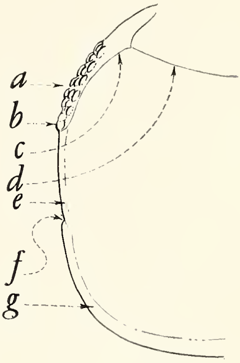

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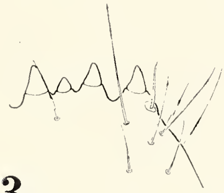

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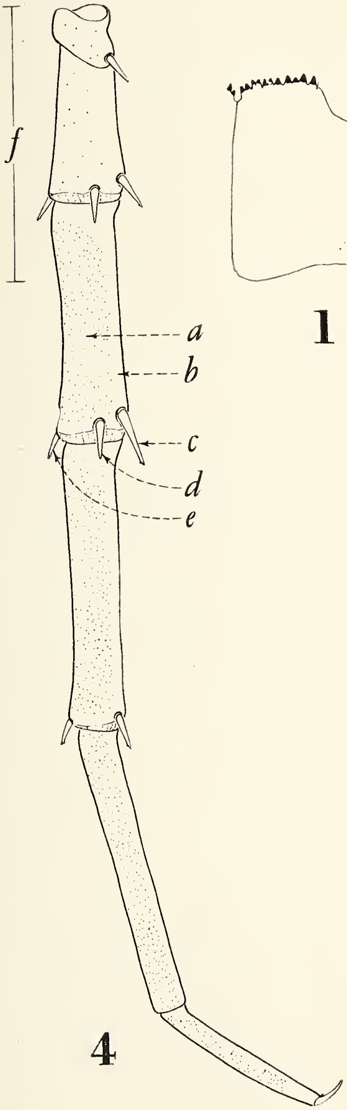

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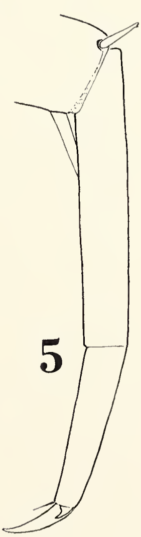

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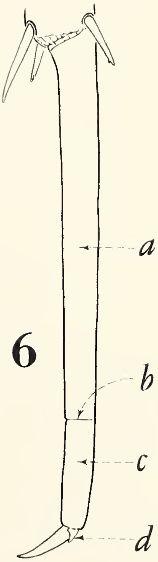

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Cursipeds.—(Fig. 6, Note D).—Each tarsus distinctly biarticulate but none with a true dorsal interarticular condyle. Each proximo- and distitarsus with two poorly-defined pectines. The cursipeds relatively longer than those of similar lithobiids, chiefly owing to elongation of tarsi. Each distitarsus relatively much shorter than its proximotarsus, the former being about ⅓ as long as the latter on each of the more posterior legs. As the whole leg increases in length on legs 1–12, the proximotarsi increase in length proportionately, but the distitarsi remain essentially constant in length. Pretarsi each with a prominent outer and inner accessory claw, the inner (unguiform) claws strongly falciform. *Coxal pores* present on legs 12–15, from front to rear 6775. Each porigerous coxa ventrally with coxal pores situated in a deep trench or scrobis (Note E) whose outer (morphologically, anterior) wall is considerably extended. Coxal pores (except one or two at each end of each row) very strongly elliptical to narrowly subrectangular, the long axis of each pore being at least 4 times the narrow axis. Porigerous coxae notably more setose than those preceding.

Tenacipeds.—(Fig. 4, Note E).—Both tenacipeds very long and thin; neither inflated as a whole or in part. The distiprefemoral articles of each densely cribrose (Note F) on inner surfaces; inner surfaces not midlongitudinally sulcate as in *Sozibius.* Each tenaciped with a complete intertarsal division; each with a true intertarsal dorsal condyle; neither with ventrotarsal pectines. Penultimate leg: length, 9.4 mm. (thus significantly longer than the 12th, which is 7.6 mm. long); entirely without general or regional inflation; totally without lobes, knobs, ridges, special setal clusters or other similar appurtenances; pretarsus with two prominent accessory claws. Ultimate leg very long and thin, 11 mm.; no article inflated; pretarsus small, with a vestigial setiform accessory claw; dorsal surface of femur flattened and shallowly, broadly excavate, with a vague sulcus within the excavation, the whole article very slightly bowed ventrally, totally without other special sexual modifications, e.g. knobs, ridges, mounds, extensions, setal clusters, etc.

Plectrotaxy.—(See accompanying chart).—Last two pairs of coxae laterally armed; last four pairs dorsally armed. Ultimate leg dorsally without supernumerary spurs. Of special diagnostic importance: DFA and DFP both continuing to the 15th leg; DTiP present on 15, DTiA present on 14; VPM absent on the legs of anterior body (present on 10–15); VTiA present on nearly all legs; VTiP wholly absent. Quantitatively: 15D = 10321, 14D = 10322; 15V = 01332, 14V = 01332.

Postpedal segments.—Male gonopods knoblike, very small, uniarticulate. Gonopods and intervening sternite densely clothed with long setae.

PLECTROTAXY OF HOLOTYPE

	DORSAL				VENTRAL			
Leg	*C*	*P*	*F*	*Ti*	*Tr*	*P*	*F*	*Ti*
1.		amp	a	a		p	am	m
2.		amp	a	a		p	amp	am
3.		amp	ap	a		p	amp	am
4.		amp	ap	a		p	amp	am
5.		amp	ap	ap		p	amp	am
6.		amp	ap	ap		p	amp	am
7.		amp	ap	ap		p	amp	am
8.		amp	ap	ap		p	amp	am
9.		amp	ap	ap		p	amp	am
10.		amp	ap	ap		mp	amp	am
11.		amp	ap	ap		mp	amp	am
12.	a	amp	ap	ap		amp	amp	am
13.	a	amp	ap	ap		amp	amp	am
14.	a	amp	ap	ap	m	amp	amp	am
15.	a	amp	ap	p	m	amp	amp	am

Paratype ♂.—With the collection data of holotype.

The paratype, evidently in the pseudomaturus stadium, agrees very closely with the holotype, differing from it in the following notable particulars. Length, 19 mm. Antennae: right with 43, left with 42 articles; 14 mm. long. Prosternal teeth: right 11, left 11; 3 on each side of the diastema are small and supernumerary. Coxae: last 2 laterally, last 4 dorsally armed. VPM beginning on 8. Last two pairs of legs missing.

CONCERNING NUEVOBIUS CHAMBERLIN

Nuevobius Chamberlin, 1941, p. 188.

Type-species: *Nuevobius cavicolens* Chamberlin, 1941. (Monotypic and original designation).

The following characterization of the genus is based upon the information presented in Chamberlin's original description in conjunction with that gained from the study of the types of *cottus*.

With two known species: *N. cavicolens* Chamberlin, 1941, p. 188, type locality, Mexico, State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa), Horsetail Falls, "in dung of bat cave, one-quarter mile from entrance"; *N. cottus*, n. sp., Tennessee, Blount

County, Tuckaleechee Caverns, near Townsend.

Distinguishing characteristics.—(Also see key, following).—In combination: prosternal teeth numerous, 6–11 on a side. Antennae multiarticular (articles more than 40) and very long, extending beyond midbody length. Tergites 11 and 13 at least shortly produced. All legs long and thin. Male penult legs not inflated, without special appurtenances, without sulci on inner surfaces; on each the femur dorsally excavate but not otherwise modified. 15D = 10310 or 10321.

Affinities.—*Nuevobius* belongs to that complex of medium to large lithobiids having: (a) higher antennal and prosternal numbers; (b) specially modified ultimate femora in the males; (c) biarticulate cursipedal tarsi; and (d) a complete or nearly complete representation of spur series (although VTiP may or may not be present). In addition, at least some of the tergites are produced, if only weakly. In the eastern United States this generic ensemble includes *Nuevobius, Sozibius, Neolithobius,* and, if it is generically distinct, *Serrobius.* These four genera are compared in a key following this section.

Of these, *Nuevobius* is surely closest in general structure to *Sozibius,* with which it may merge should the discovery of additional species warrant such an amalgamation. Apart from the overall similarity of the two, it seems clear that they resemble one another in a number of critical individual characters as well, specifically:

(1) The antennal number is high, always exceeding the 20–25 range, which is usually diagnostically critical in American lithobiids and ethopolyids. That is, the vast majority of species fall into one of two groups in this regard: in a given species the antennal number is either 20, intraspecifically varying from about -1 or -2 to $+2$ (as much as $+5$ being very uncommon), or else the antennal number exceeds 25, usually being much higher, in which case intraspecific variation increases in range approximately proportionately with increase in mode. In the high-count category it is possible to distinguish subcategories, but they are usually rather unstable. The most practical gross division distinguishes between: (A) species with 20 (-2 to $+5$) articles, and (B) species with at least 25 and usually more than 30 articles.

(2) In each genus the prosternal number is always greater than 2 per side, being 4–11 per side in known adults. The prosternal number of 2 per side is specified because it too represents a diagnostic point of departure. That is, in the majority of North American species known to me an adult prosternal formula of $2+2$ is

absolutely stable intraspecifically, whereas any higher number tends to be variable within the species. In addition, the higher the modal number, the greater the range of intraspecific variability. For example, every known specimen of *Nadabius pullus* (Bollman) has an unvarying number of 2 per side, i.e. full formula, 2 + 2, and the same can be said of scores of other species, e.g. *Nampabius dendrophilus* Chamberlin, *Pokabius bilabiatus* (Wood), *Garibius opicolens* Chamberlin, *Sigibius puritanus* Chamberlin; numerous other examples could be offered in evidence. On the other hand, in *Nadabius aristeus* Chamberlin the prosternal number is 3 to 4 per side, an adventitious fifth being seen in rare cases; in *Sozibius proridens* (Bollman) the number per side varies from 5 to 7; in *Lithobius forficatus* (Linnaeus) it varies from 5 to 10 or even more.

(3) In *Nuevobius* and in all but two species of *Sozibius* tergite 9 is never produced, 11 and 13 being very weakly to moderately produced.

(4) In both genera the limbus is pronounced and is laterally distinctly broken, the depth of the disjuncture varying interspecifically.

(5) In both genera the tarsi of the cursipeds are biarticulate but lack true intertarsal condyles, which, however, always occur on the tenacipeds.

(6) In both, the inner surfaces of the distiprefemoral articles of the tenacipeds are densely cribrose.

(7) In both, the interdental diastema of the prosternum is U-shaped.

(8) In both, the ultimate male femur is dorsally excavate and more or less bowed ventrally.

(9) In both, at least some of the posterior coxae are laterally armed.

Admitting that our knowledge of both, particularly of *Nuevobius*, is as yet limited, on the basis of existing information it is possible to suggest that the two differ significantly as follows:

Sozibius: (1) Antennae do not reach midbody length; antennal articles are relatively shorter than in *Nuevobius*. (2) Major tergites are shorter, more nearly quadrate. (3) Prehensorial ungula is shorter, somewhat more robust. (4) Porodont is about as long and robust as adjacent setae. (5) Each of the rear porigerous coxae is flat or nearly flat ventrally, scrobes being absent; the coxal pores are circular to subcircular. (6) The distitarsi of the rear cursipeds are about half as long as their proximotarsi. (7) Inner surfaces of distiprefemoral articles of tenacipeds are distinctly midlongitudinally sulcate. (8) Male ultimate femur inflated as a whole and usually regionally in addition; typically with high mounds or extensions; always with special setal clusters; in some species the prefemur is also regionally inflated and bears special setal clusters. (9) DFA never extends to 15, only to 11 or 12; DTiA extends to 11 or 12; VPM extends in all species from 1 through 15.

Nuevobius: (1) Antennae reach beyond midbody length, at least to level of 10th tergite; articles are relatively longer. (2) Major tergites are longer, more rectangular. (3) Prehensorial ungula is longer, thinner. (4) Porodont (at least in *cottus*) is much finer and shorter than neighboring setae. (5) Each of the rear porigerous coxae ventrally is deeply scrobate; within each scrobis the pores, particularly the more central ones, are extremely elongate and narrow. (6) The distitarsi of the rear cursipeds are about ⅓ as long as their proximotarsi. (7) Inner surfaces of the distiprefemoral articles of tenacipeds are not sulcate. (8) Male ultimate femur is not at all inflated and lacks projections, mounds, and setal clusters; prefemur is entirely unmodified. (9) DFA extends from 1 through 15; DTiA extends through 14; VPM is variable but commences well toward the rear of the body.

KEY TO GENERA

The following key includes those eastern North American genera having the following characteristics in combination: prosternal teeth more numerous than 2+2; antennal articles more numerous than 28; ultimate leg of male with pronounced sexual modifications.

1a. Tergites 7–9–11–13 distinctly produced. Spur series VTiP present in some species
Neolithobius Stuxberg (*sensu* Chamberlin)

1b. Tergite 7 never produced. In most, tergites 11 and 13 are not produced or are weakly produced. Tergite 9 is weakly produced in *Sozibius texanus* Chamberlin, and it is strongly produced in an as yet undescribed species of the genus. VTiP evidently never present 2

2a. Antennae very long, reaching as far as, or to the end of tergite 10. On legs 10–12 the distitarsi are very short in relation to the proximotarsi, being about ⅓ as long. Coxal pores very strongly elongate and set into deep coxal scrobes. Ultimate leg of male very long and slender, no article inflated, not compressed laterally; femur dorsally excavate and shallowly sulcate, without setal clusters or special appurtenances; prefemur without supernumerary spurs dorsally; inner surfaces of articles not sulcate (cavernicolous forms)
Nuevobius Chamberlin

2b. Antennae shorter, not reaching as far as tergite 10. On legs 10–12 the distitarsi are longer in relation to the proximotarsi, being about half as long. Coxal pores usually subcircular, at most being weakly subelliptical; usually on the flat ventral coxal surface, at most in very shallow depressions. Male ultimate leg notably inflated as a whole and relatively shorter, compressed laterally; femur always strongly inflated, the prefemur in some species inflated; femur dorsally excavate, with pronounced elevations anteriorly and posteriorly or at one end or the other, with special setal clusters, often strongly ridged on outer side; prefemur sometimes strongly inflated and with special setal clusters; with supernumerary dorsal spurs (only in *Sozibius pulchellus* (Causey)[2]; inner surfaces deeply to weakly sulcate 3

3a. 15th coxa said to be armed with a ventral spur *Pearsobius* Causey[3]

3b. 15th coxa ventrally without a spur . . . . . . *Sozibius* Chamberlin

APPENDIX NOTES

A. New Term. Limbus, pl. limbi: a second-declension Latin masculine noun meaning border, rim, margin. Here it is applied restrictively to the lateral and posterior raised margin of the cephalic plate as it occurs in most Lithobiomorpha and many Scolopendromorpha. Adjective, limbate. See Fig. 2, e, g.

B. New Term. The antennocellar suture is here defined as that sinuous anterolateral suture on each side of the head that passes from the antennal socket, where it arises in the vicinity of the dorsal articular processes, posteriorly to meet the lateral end of the frontal suture, whence it curves backward to delineate the dorsomesal and posterior limits of the ocellar area. See Fig. 2, c.

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[2] New Combination. The Causey species was proposed (1942, p. 79) as the type-species of a new genus, *Serrobius,* which here is regarded as a subjective junior synonym of *Sozibius.*

[3] The generic distinctiveness of *Pearsobius carolinus* Causey (1942, p. 80), the type-species of *Pearsobius,* rests in some doubt. Dr. Causey's original description called particular attention to the presence of a ventral coxal spur on leg 15, which is indeed a distinctive characteristic, if it is constant and not a phenotypic anomaly. I have seen specimens from North Carolina and Virginia that agree closely with *carolinus* in every feature but this one. If the ventral coxal armature of *carolinus* is anomolous, then it would come within *Sozibius.* Under the circumstances I should not feel justified in formalizing such a merger without first studying the types, which are unavailable.

C. Major ocellus is intended to specify the large, often discrete, posterior-most ocellus of the ocellar area. In the familiar ocellar formula it is cited to the left of the plus sign, e.g. 1 + vwxyz. The smaller, seriate ocelli, which are always anterior to and usually well separated from the major ocellus, may then be termined the minor or *seriate ocelli.* See Fig. 2, b.

D. New Terms. Cursipeds, tenacipeds. Cursiped is a new term devised to specify any one of the first 13 pairs of legs. The word is based upon the Latin words *pes,* foot, and *cursus,* the perfect past participle of *currere,* to run. Tenaciped refers to the 14th or the 15th leg and is formed from *pes* and *tenax* (genitive, *tenacis*), meaning holding firmly, gripping.

Etymologically, they are suggestive of an essential division of labor manifest within the anteroposterior series of body legs. The legs of at least the anterior two-thirds of the body are concerned primarily with locomotion. The more posterior legs, notably the last two pairs, but not necessarily these alone, although possibly instrumental in effecting locomotion to some extent, are primarily anchoring and raptorial devices. It is not suggested that this functional division is absolute, only that it is valid within limits, and that in any event the present designatory device is useful and expedient.

Thus for descriptive and diagnostic purposes it is convenient to treat the legs as if they were divisible into two groups, one comprising legs 1–13, the other, legs 14 and 15. A number of pedal characteristics justifies this somewhat artificial grouping.

(1) Proceeding from front to rear, we see that the legs manifest at least two gradual changes: they become longer; their long axes swing posteriorly, successively forming a smaller angle with the longitudinal axis of the body. In other words, each successive leg tends more closely to approach being parallel to the body's long axis. In the Lithobiinae and Ethopolyinae the 14th and 15th legs are usually disproportionately slightly longer and more parallel to the body's long axis than the preceding legs. (2) In the Lithobiinae (but not in the Ethopolyinae) all species known to me to have biarticulate tarsi lack true intertarsal condyles on legs 1–13. In these the circumarticular suture is simply interrupted dorsally by unmodified exoskeleton. But in all Lithobiinae each of legs 14 and 15 has a biarticulate tarsus and a true intertarsal condyle. Note that the tenacipeds have true condyles whether or not the cursipeds have

biarticulate tarsi. (3) When tarsal pectines are present, they occur only on the cursipeds, never on the tenacipeds. (4) In all species known to me the cursipeds invariably have two pretarsal accessory claws, but one or both tenacipeds may have one or the other, both, or no accessory claws. (5) Male secondary sexual modifications, when present, occur on one or the other, or on both of the tenacipeds; they are rarely, if ever, present on the cursipeds. (6) Several plectrotaxic criteria lend weight to this division. When VTiP is present on some or on all of the cursipeds, it rarely, if ever, occurs on the tenacipeds. When VCM is present, it nearly always occurs only on 15, or on 14 and 15. DTiA, which is common on the cursipeds, is uncommon on 14 and rarely occurs on 15. (7) It is well known that certain articles of the last two legs have densely porous inner surfaces, whereas in the majority of known species the homologous cursiped leg surfaces are often described as being non-porous. This, however, is in error, for careful examination shows that the cursipeds too are porous, though their pores are so sparse and small that they readily escape detection. Therefore, the distinction should properly be drawn between (a) *densely* porous (or better, cribrose) leg articles and (b) *sparsely* porous (or non-cribose) leg articles. The new designation, *cribose,* is introduced here to specify only those leg surfaces that are densely porous. The reader should be warned, however, that whereas many lithobiids conform to this pattern (i.e. 1–13 non-cribose, 14 and 15 cribose), some do not. For instance, in several species of *Tidabius* legs 13–15 are cribrose; in a number of neotropical gosibiids many of the cursipeds anterior to the 13th are cribrose. Once thoroughly studied, this subtle character will probably prove very useful in specific and supraspecific diagnoses. Cf. Figs. 4, a and 6, a.

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NOTES ON ALASKAN DROSOPHILIDAE (DIPTERA), WITH THE DESCRIPTION OF A NEW SPECIES

By Marshall R. Wheeler[1] and Lynn H. Throckmorton[2]

During July and August, 1960, we had an opportunity to make *Drosophila* collections in Alaska, primarily to obtain cultures of *D. montana* for use in studies of evolutionary cytology. A number of other species were also attracted to the yeasted banana bait and several species of *Scaptomyza* and *Chymomyza* were collected by other means. There are so few reports of Alaskan Drosophilidae that these new collections have more than tripled the number of species recorded from the state. We have supplemented our data with the unpublished collection records of Dr. Dwight Miller of the University of Nebraska who worked in the Anchorage-Palmer and Fairbanks-College areas during the summer of 1957. The Alaskan records of Hackman (1955, 1959) for the genus *Scaptomyza* have also been included.

The principal localities from which Drosophilidae have been taken are shown on Fig. 1. The winding broken line within the state shows, very roughly, the approximate limit of the spruce-birch interior forests. The tundra region, mostly in the north and west, is not absolutely treeless, however, since there are small willows, alders, and occasionally cottonwoods, especially along rivers and stream banks. Collections at King Salmon and Bethel were marginal, the preponderant heath tundra interdigitating with the sparse stands of stunted spruce; several species of *Drosophila* were taken at these marginal locations, but the populations appeared to be quite small. Cape Thompson, the site of Project Chariot of the U. S. Atomic Energy Commission, and Nome are both well removed from forested areas, and we were unable to catch any *Drosophila* at either of these tundra areas (except for *Drosophila immigrans* in a store), although we did collect single specimens of *Scaptomyza* at each of them.

In view of the great size of the state and its considerable variety of habitats, the present report cannot be considered as more than preliminary. It seems clear, however, that the variety of species of Drosophilidae to be expected in such northern latitudes will inevitably be much smaller than that of more moderate climatic regions. On the other hand Alaskan collections are of special interest in detecting additional examples of Holarctic species, particularly with regard to species previously considered to be limited to the Palaearctic region. Basden (1956) in his excellent summary of the species of Drosophilidae from the arctic regions (defined as that area north of the Arctic Circle) points out that the number of species of the family recorded as common to the Nearctic and Palaearctic regions is 22, but that nine of these, and probably more, are dubiously conspecific in both regions, and that many of the remainder are cosmopolitan species. The real paucity of the family in arctic areas is clearly demonstrated by Basden (*op. cit.*) and Basden and Harnden (1956); only 24 species out of well more than 1000 in the family were definitely recorded from north of the Arctic Circle (Lat. 66° 32′ N). It was further pointed out that not a single species was known from the arctic areas of Alaska, Canada or Greenland. Our collection of a specimen of *Scaptomyza* from Cape Thompson (*c.* Lat. 68° 10′ N), therefore, represents the first record of a Drosophilid from arctic North America.

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Approximately one-third of that part of Alaska lying north of the Arctic Circle (Fig. 1) is forested. Since the only known attempt to collect Drosophilidae in the far north was in a tundra area, the apparent absence of the family in arctic Alaska is misleading. In fact, it seems safe to predict that in the forested areas north of Fairbanks collectors will find *Drosophila athabasca, montana, testacea* and *subquinaria,* one to several species of *Scaptomyza* and *Chymomyza,* and possibly occasional specimens of "domestic" species within buildings as well.

Alaskan Species of Drosophilidae

1. *Drosophila* (*Drosophila*) *montana* Stone, Griffen and Patterson, 1941. Anchorage, Big Lake, Matanuska Valley, King Salmon, Bethel, Fairbanks, College. *D. montana* is found only in moist areas near streams and lakes where it is associated with cottonwood or alder. In California, Wyoming and Oregon the larvae were found in the decaying phloem tissue of cut or broken limbs and trunks of these trees.

2. *D.* (*Drosophila*)*testacea* von Roser, 1840. Anchorage, Fairbanks, College. This Holarctic species is largely, if not entirely, fungivorous, but it is readily attracted to banana bait.

3. *D.* (*Drosophila*) *melanderi* Sturtevant, 1916. Anchorage. Our four specimens represent the first record of this fungivorous

species in Alaska; the nearest previous known locality was in Washington.

4. (*Drosophila*) *immigrans* Sturtevant, 1921. Nome. This cosmopolitan, "domestic" species was found by us around bananas, tomatoes and potatoes in a grocery store.

5. *D.* (*Drosophila*) *funebris* (Fabricius), 1787. Big Lake, Matanuska Valley, Palmer, College. Dr. Dwight Miller (personal communication) reports that this cosmopolitan species was sometimes found breeding in rotting potatoes in such numbers in the Matanuska Valley that the adults were considered a nuisance in homes.

6. *D.* (*Drosophila*) *subquinaria* Spencer, 1942. Anchorage, Big Lake, Kodiak, King Salmon, Bethel, Fairbanks. It has been shown elsewhere (Wheeler, 1960) that this fungivorous species is probably the same as the Palaearctic *transversa* Fallén, while the species in North America which has erroneously been called *transversa* was undescribed and has now been named *falleni.* Laboratory tests are now in progress which should settle the question of the identity of *subquinaria* and *transversa.*

7. *D.* (*Sophophora*) *athabasca* Sturtevant and Dobzhansky, 1936. Anchorage, Big Lake, King Salmon, Bethel, Fairbanks, College, Matanuska Valley, Dead Man's Lake; also from Chitina, Juneau, Ketchikan and Gravina Island (Dobzhansky and Epling 1944). This is by far the most common species in the forested areas of Alaska, and is one of the most widely distributed native species of *Drosophila* in North America (Miller, 1958). It is readily attracted to fermenting banana bait.

8. *D.* (*Sophophora*) *melanogaster* Meigen, 1830. Anchorage. We found this cosmopolitan species in a grocery store; Dr. Miller found a male in an apartment building. As with *D. immigrans* there is no evidence that this species has established itself in wild environments in Alaska .

9. *D.* (*Sophophora*) *populi* new species. Anchorage. This new species, represented by 37 individuals swept from a fallen cottonwood tree along Rabbit Creek, is described below.

10. *Scaptomyza* (*Hemiscaptomyza*) *terminalis* (Loew), 1863. Sitka, Anchorage, Kodiak. The type locality was Sitka and, according to Hackman (1955, 1959), the species has never been found elsewhere.

11. *S.* (*Hemiscaptomyza*) *trochanterata* Collin, 1953. Anchorage, Matanuska, Fairbanks. The species was first reported as Holarctic by Hackman (1959) ; it is widespread in the Palaearctic region.

12. *S.* (*Hemiscaptomyza*) *unipunctum* (Zetterstedt), 1847. Bethel, Fairbanks. This is the first record from North America; Hackman (1959) reported it from Kamchatka as well as other Palaearctic areas. Although our new records are based upon single males from each locality, the male genitalia agree quite well with that described for *unipunctum.*

13. *S.* (*Scaptomyza*) *teinoptera* Hackman, 1955. Sitka. Hackman (1955) first reported the presence of this Holarctic species in Alaska; there are no additional records for the Nearctic.

14. *S.* (*Scaptomyza*) *flaveola montana* Wheeler, 1949. Fairbanks, Sitka. We found a single male of *montana* near Fairbanks; although it was first described as a species, Hackman (1959) placed it as a subspecies of *flaveola* (Meigen) 1830. Coquillett (1900) recorded *flaveola* from Sitka; we have not seen his specimens but they were most likely also *montana* since the nominate form is not known to occur in the Nearctic.

15. *S.* (*Scaptomyza*) *nigrita* Wheeler, 1952. Fairbanks. The identification of this species, a new record for Alaska, is based on a single female, and females are not readily identifiable in this genus. The specimen agrees quite well, however, with the type material from California.

16. *S.* (*?Scaptomyza*) species undetermined. Cape Thompson. A single male was taken by sweeping near the Project Chariot site; it does not agree with any of the described species but it shows some similarities to *norica* Hackman from the Austrian Alps. It is especially remarkable in possessing five well-developed orbital bristles, two proclinate and three reclinate (*norica* has one proclinate and three reclinate). The humeral bristles are damaged, making the subgeneric reference uncertain but probable.

17. *Chymomyza aldrichi* Sturtevant, 1916. Anchorage, Big Lake, Matanuska Valley, Bethel, Fairbanks, College. This is a rather common and widespread species in Alaska; although it is usually found around freshly cut tree trunks, it comes to banana bait quite readily.

18. *C. caudatula* Oldenberg, 1914. Anchorage. This Holarctic species is widely distributed across North America. Our two specimens were found on a freshly cut tree trunk.

19. *C. coxata* Wheeler, 1952. Anchorage, Fairbanks. This is not only a new record for Alaska, but also a considerable extension of the known range, having been collected previously only in Colorado and Wyoming.

20. *C. wirthi* Wheeler, 1954. Anchorage. We found a single

male; the species was previously known only from Ontario and Virginia.

21. *Amiota* (*Amiota*) species undetermined. Anchorage. The single female specimen has not been identified; it runs to *alboguttata* Wahlberg in the available keys but it seems probable that several species are currently included under that name. Members of the genus are often quite annoying, flying near and resting on one's eyes and ears. We suspect that *Amiota* is not this rare in Alaska but the swarms of *Simulium* are sometimes so great that an occasional *Amiota* among them is apt to be overlooked. The use of repellents against attacks of mosquitoes and *Simulium* probably also reduces the opportunity for capturing *Amiota.*

Other species. Dr. Miller classified a specimen from College as *Drosophila putrida* Sturtevant, dark form; it was not possible to check this carefully, but since *putrida* was not taken by us during the summer of 1960 it seems probable that he was dealing with an aberrant individual of *testacea* which is rather common in the Fairbanks region. He also identified, but with considerable doubt, *Drosophila suboccidentalis* Spencer from College, Dead Man's Lake, and the Matanuska Valley. The few available specimens remaining from his Alaskan material have been re-examined and only *subquinaria* was present among them. However, *D. occidentalis* Spencer was present among flies taken by him at Rancheria River, Yukon Territory, so that it is quite probable that this species also occurs in Alaska.

There are, in addition, several Alaskan species which have sometimes been included in the Drosophilidae but which are currently placed in other, more restricted, families. *Aulacigaster leucopeza* (Meigen) of the Aulacigasteridae, which is apparently widespread in the forested areas, belongs in this category as does *Campichoeta* (= *Thryptocheta*) *micans* (Hendel) of the Diastatidae, which we found near Fairbanks.

Drosophila (Sophophora) populi, n. sp.

This new species is quite similar in size and general appearance to *D. athabasca,* but it may be separated from the latter readily by the wholly pale legs and pale lower pleura, the much brighter red eyes in life, the bristled, non-dentate ovipositor of the female, and the absence of sex combs on the male fore tarsi.

Thirty-seven specimens were collected along Rabbit Creek, south of Anchorage. Banana baits were placed in the vicinity of a recently felled cottonwood tree (*Populus* sp.); portions of the tree were immersed in the stream and there was a faint, but definite, fermentation odor in the area. Both *D. populi* and *D. montana* were collected by sweeping among the branches and broken limbs of the tree, while very few were attracted to the bait. Of 82 *montana* taken at this locality, we estimate that fully 90% came from the tree, and an estimated 98% of the *populi* were obtained by sweeping among the branches. Most of the specimens were placed on a *Drosophila* culture medium but we were unable to secure a stock, all of the larvae dying in the food vials before pupation.

Description.—♂, ♀. Front dull black, the orbits and ocellar triangle gray; antennae blackish. Face black (♂) or dirty tan (♀), the carina forming a very low ridge bounded by rather deep foveae. Oral margin somewhat protruding, the clypeus narrow and black. Cheeks narrow, dark tan beneath the eye, black in the area of the oral bristles. Vibrissa single, rather short. Palpi dirty yellow, darker apically.

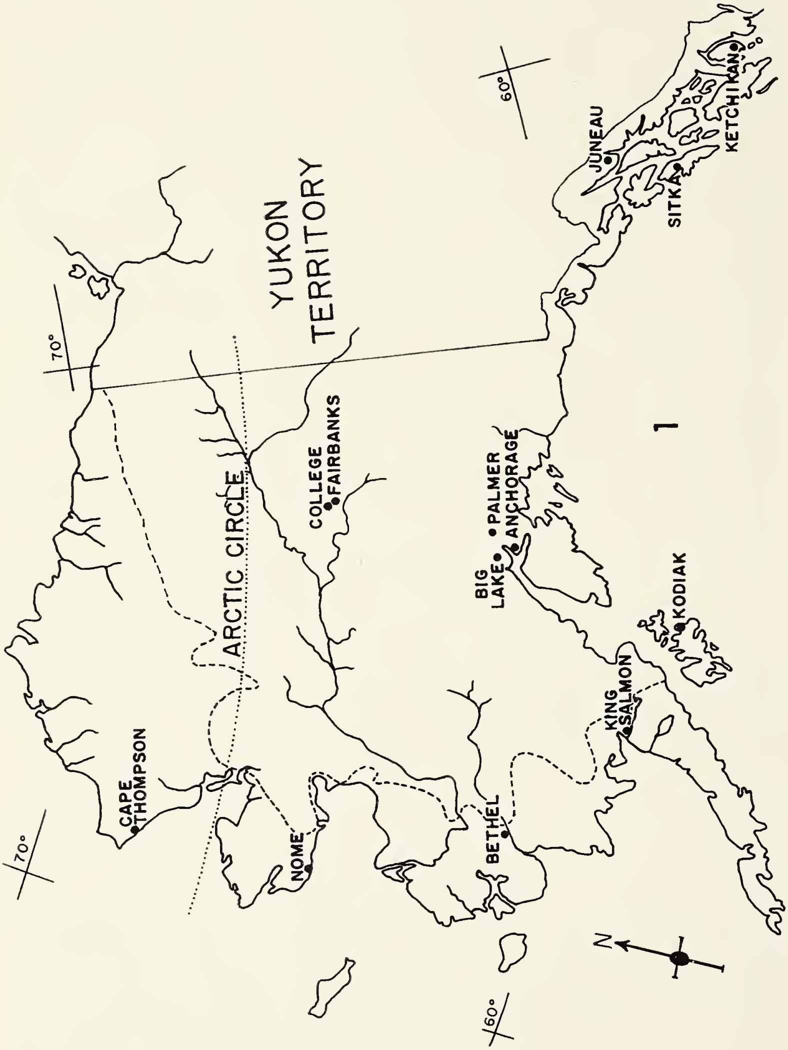
Proclinate orbital only a trifle shorter than posterior reclinate, the anterior reclinate thin, about 1/3 the length of proclinate and situated rather close to the latter. Ocellars, inner and outer verticals, and postverticals all well developed. Arista with 3 (rarely 4) dorsal and 2 ventral branches basal to the terminal fork, all branches rather short.

Mesonotum dull black with thin grayish pollinosity. Basal scutellars convergent to straight. Acrostichal hairs in about 8 rows, but quite irregular; often with a pair of enlarged prescutellar acrostichals but their size is not constant. No propleural bristle; anterior sternopleural 3/5 the length of posterior, the middle one small and thin. Pleura dark above becoming yellowish below on

EXPLANATION OF PLATES I AND II

Fig. 1, Map showing principal localities in Alaska where collections of Drosophilidae have been made. Figs. 2–10, *Drosophila populi,* new species. Fig. 2, Male reproductive system, showing testes (stippled) and paragonia. Fig. 3, Sperm pump, lateral view; the ventral ejaculatory apodeme (stippled) is strongly pigmented black. Fig. 4, Ejaculatory apodeme, ventral view. Fig. 5, Egg, lateral view, showing strongly sculptured surface. Fig. 6, Egg, ventral view, showing filaments continued along ventral surface as heavy ridges. Fig. 7, Ovipositor, lateral view. Fig. 8, Female reproductive organs, dorsal view, showing spermathecae and parovaria. Fig. 9, Female ventral receptacle, shown after clearing in phenol. Fig. 10, Spermatheca, inner sclerotized capsule.

Wheeler and Throckmorton Plate I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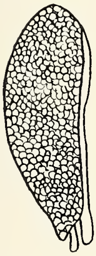
WHEELER AND THROCKMORTON PLATE II



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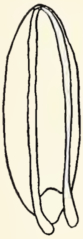

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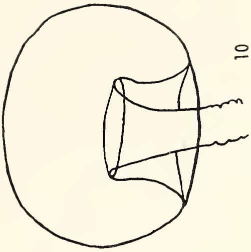

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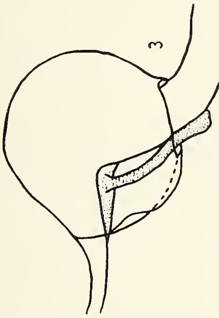

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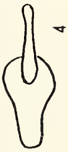

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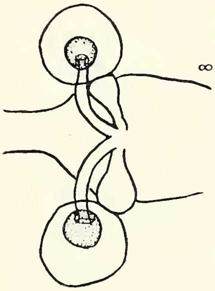

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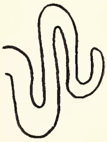

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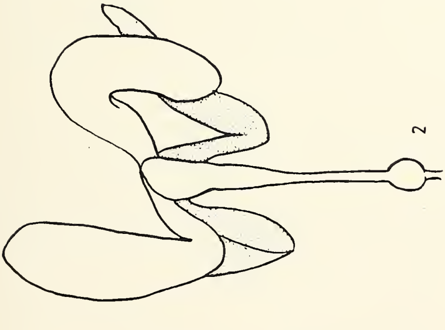

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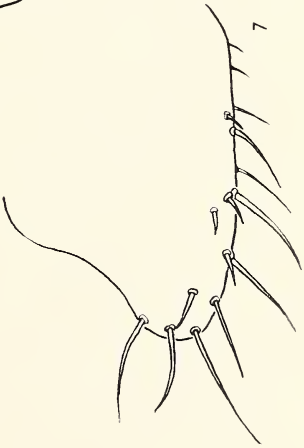

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sternopleura. Legs, including fore coxae, all pale yellowish, without unusual bristling. Abdomen wholly black with thin pollinosity. Wings hyaline; costal index about 2.4; third costal section with the short black bristles on the basal 1/4 to 2/5.

Upper anal plate of female with a pair of unusually long bristles; ovipositor (Fig. 7) with a series of slender bristles, not dentate. The male external genitalia and copulatory structures are described in detail by Dr. Takada in the following article.

One male and one female were sacrificed for dissection. Malpighian tubules with short stalks, less than 1/4 their total lengths; posterior pair with their tips apposed but lacking a continuous lumen. Testes (Fig. 2) appearing red through the body wall, but showing an orange-brown pigmentation when dissected free; one paragonium directed anteriorly, the other posteriorly. Inner capsule of spermatheca (Fig. 10) dark and relatively small; ventral receptacle (Fig. 9) forming a short serpentine sac. Male sperm pump (Fig. 3) without diverticula, the ejaculatory apodeme black.

Eggs (Fig. 5, 6) with two short filaments which are clearly continued along the surface as heavy white ridges; egg surface strongly sculptured. Posterior spiracles of larva rather short, parallel, pale with brownish tips. Puparium not seen.

Relationship.—The affinities of this new species are uncertain but a relationship with the subgenus *Sophophora* seems most likely. There are only two egg filaments as in *Sophophora,* but they are not constructed as in that subgenus. The male genitalia, both internal and external, are rather similar to those seen in members of the *obscura* species group of *Sophophora,* but some features are unique. The bristled ovipositor of the female is, strangely, most like that found in the genus *Chymomyza.* For the present we are assigning *populi* to the subgenus *Sophophora,* but we cannot place it in any of the established species groups.

Types.—*Holotype* male and 8 *paratypes,* collected July 22–24 and Aug. 4, 1960, from the above described locality near Anchorage, Alaska. Two paratypes are being placed in the collection of the U. S. National Museum, Washington, D. C.; all other types are in the *Drosophila Type and Reference Collection* of the Genetics Foundation, The University of Texas, Austin.

ACKNOWLEDGMENTS

The collecting trip during the summer of 1960 was made possible by grants from the Rockefeller Foundation and the National Institutes of Health (RG-6492). We wish to express our appreciation to Dr. W. S. Stone who collected some of the material at Anchorage and Kodiak, and to Dr. D. D. Miller for providing us with his valuable Alaskan collection records. Numerous individuals in Alaska deserve special mention for their help, most especially Drs. Rausch, Sommerman and Williamson of the Arctic Health Research Center, Anchorage, and the staffs of the Alaska Fish and Game Department at Kodiak and King Salmon. At the U. S. Atomic Energy Commission's Project Chariot site at Cape Thompson, Dr. John Wolfe, Chief, Environmental Sciences Branch, Division of Biology and Medicine, and Mr. Henry Schlacks, Director of Project Chariot, were most helpful in providing us with living and working facilities. The figures were prepared by Mrs. Linda Kuich, our staff artist.

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THE MALE GENITALIA OF *DROSOPHILA POPULI* WHEELER AND THROCKMORTON (DIPTERA; DROSOPHILIDAE)

By Haruo Takada[1]

The species *Drosophila populi* was described by Wheeler and Throckmorton earlier in this publication. The male genitalia show a number of unusual features which should be described as a supplement to their description.

The author wishes to express his sincerest appreciation to Professor Wilson S. Stone, University of Texas, for providing the opportunity to work in the Genetics Foundation, and is especially indebted to Professor Marshall R. Wheeler, University of Texas, for his constructive criticisms and for furnishing the material for the present study. I wish to thank Mrs. Linda Kuich for her assistance in the preparation of the figures.

External genital apparatus.—Genital arch (Fig. 1) dark brown, broad and convex below, the undermargin sclerotized, the heel triangular. Lower portion of arch with about 10 bristles, the upper portion with about 38 hairs. Primary clasper (Fig. 1) dark brown, with a prominent thumb-like process and with 10–11 long primary brownish black teeth; inner surface of clasper with usually two fine bristles and about six short but stout bristles. Bridge (Fig. 2) connecting the clasper (decasternum of Okada, 1954) brown, elongate, and proximally with triangular lateral pieces; median piece rodlike, orange brown.

Explanation of Plate

Figs. 1–4, Male genitalia of *Drosophila populi.* Fig 1, External genital apparatus. Fig. 2, Bridge (decasternum) connecting the claspers. Fig. 3, Male copulatory organs, ventral aspect (left side) and dorsal aspect (right side). Fig. 4, Male copulatory organs, lateral aspect.

Abbreviations: *ap,* anal plate; *ga,* genital arch; *c,* clasper; *h,* heel; *pt,* primary teeth; *ag,* anterior gonapophysis; *pg,* posterior gonapophysis; *hy,* hypandrium; *n,* median notch of hypandrium; *sb,* submedian spine of hypandrium; *p,* penis; *sa,* sensilla of anterior gonapophysis; *b,* basal apodeme of penis.

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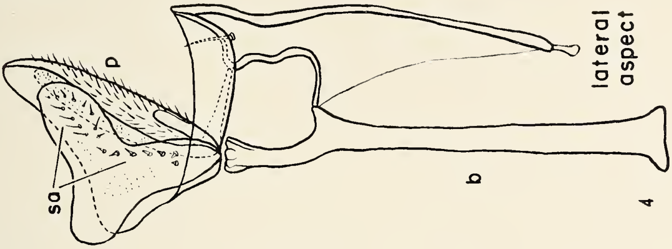
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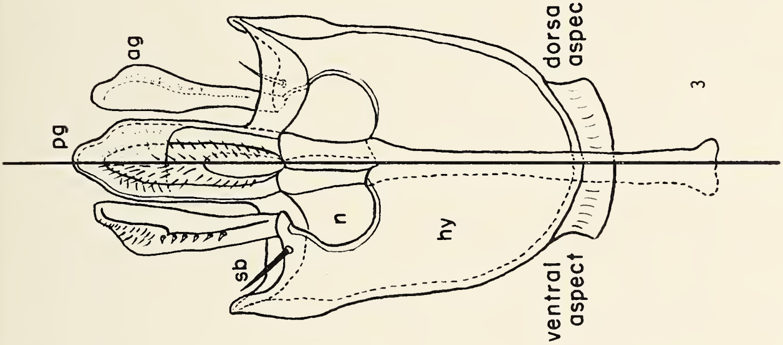
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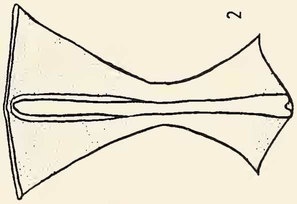

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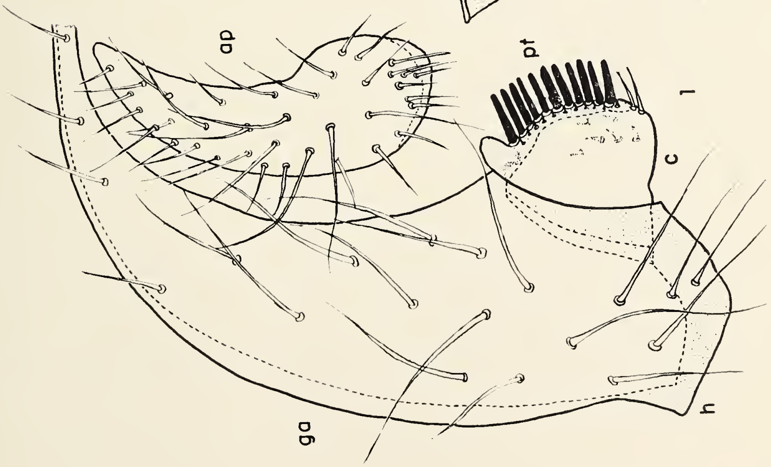
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Copulatory organs.—Penis (Fig. 4) pale brown, oblong, with numerous hairy structures. Anterior gonapophyses (Fig. 3) yellowish brown, curved ventrally, rounded apically, the outer surface of the upper portion with about 20 stout hairs and medially with a row of about seven spines. Posterior gonapophyses as long as the anterior ones, the fused upper portion of the inner surface with many hairy structures, separated from the penis, and surrounding the dorsal surface of the latter.

Hypandrium brown and quadrate, nearly as long as broad, the median notch deep and broad. Phallosomal index (Okada 1953; a ratio between the length of the penis and its apodeme) about 0.5.

Discussion.—The morphological differences described by Wheeler and Throckmorton in this same issue of the Bulletin and the present study show that *Drosophila populi* is distinct from all the other known species of the genus, and that it is probably related to the subgenus *Sophophora.* To discuss the relationships of species on the basis of only a few organs can be dangerous, but it is allowable when one is dealing with the male genitalia which is composed of several morphologically distinct elements. Similar conclusions were reached by others who have studied male genitalia, for example: Salles (1947), Malogolowkin (1948, 1952, 1953), Nater (1953), Burla (1956), Spassky (1957) and also Hsu (1949) from his study of the external genital apparatus. Extensive comparative studies of the copulatory organs have also been done by Okada (1953, 1954, 1955, 1956).

Although the present species has a relatively small phallosomal index, separated anal plate, distinct anterior gonapophyses with sensilla, and some features of the bridge connecting the claspers, each of which is characteristic of the *obscura* group of *Sophophora,* it does not agree with any of the known species of this group, having clearly fused upper portion of the posterior gonapophyses, penis with hairy structures, deep median notch of the hypandrium and thick anterior gonapophyses. Thus the present species should be placed near the *obscura* species group of the subgenus *Sophophora,* genus *Drosophila.*

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THE CONOPID FLIES OF IDAHO (DIPTERA: CONOPIDAE)[1]

B. A. Foote and A. R. Gittins[2]

For many years the Department of Entomology at the University of Idaho has carried on a survey of the insects occurring in Idaho. Recently, increased emphasis has been placed on survey work, and a series of papers concerned with the Idaho fauna is being prepared.

Intensive collecting of conopid flies in the state, particularly by W. F. Barr and the junior author, has resulted in the collection of 28 species. It is believed that the list included here is fairly complete and that relatively few additional species will be obtained in Idaho. Camras and Hurd (1957) recorded 39 species from California, and Smith (1959) listed 18 species from British Columbia. Keys to the species (except *Zodion abitus* Adams) known to occur in Idaho can be found in the paper by Camras and Hurd.

All specific determinations were made by Dr. Sidney Camras from material in the University of Idaho collection only. Appreciation is expressed to him and the individuals listed below who have contributed specimens: C. C. Ball (CCB), W. F. Barr (WFB), D. A. Burgh (DAB), T. B. O'Connell (TBO), D. Evans (DE), B. A. Foote (BAF), A. R. Gittins (ARG), R. W. Haegele (RWH), H. L. Harris (HLH), H. W. Homan (HWH), S. E. Knapp (SEK), R. A. Mackie (RAM), H. C. Manis (HCM), H. D. Neeley (HDN), R. W. Portman (RWP), P. Price (PR), W. E. Shull (WES), H. W. Smith (HWS), A. J. Walz (AJW).

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[1] Published with the approval of the Director of the Idaho Agricultural Experiment Station as Research Paper #504.

[2] Department of Entomology, University of Idaho, Moscow, Idaho.

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CONOPINAE

Physoconops fronto (Williston). Lewiston, August 15, 1951, on *Melilotus* sp. (WFB); Three miles south of Whitebird, August 8, 1958 (ARG); Parma, July 7, 1958 (HWH); Two miles west of Marsing, July 25, 1958, reared from alkali bee (*Nomia melanderi* Cockerell) nesting site (HWH); Grandview, August 9, 1958 (HCM); Hot Springs in Owyhee Co., July 4, 1951 (WFB); Melba, July 17, 1945, on carrots (WES); Caldwell, July 20, 1945, on carrots (WES); Massacre Rocks in Power Co., June 29, 1954 (ARG).

Physoconops obscuripennis (Williston). Priest River Forest Exp. Station, July 18, 1957 (ARG).

Physocephala burgessi (Williston). Gibbons Pass near Gibbonsville, July 20, 1957 (HCM).

Physocephala marginata (Say). Five miles west of Athol, July 16, 1959 (WFB); Slate Creek, September 19, 1955 (WFB); Jerome, July 27, 1953 (ARG).

Physocephala texana (Williston). Moscow, August 1, 1951 (WFB); Lewiston, July 8, 1945 (AJW); Slate Creek, September 18, 1955, on *Chrysothamnus* sp. (ARG); Donnelly, August 28, 1952 (SEK); Parma, June 25, 1954 (AJW); Given Springs in Owyhee Co., June 20, 1954 (WFB); Hot Springs in Owyhee Co., June 28, 1953 (WFB); Homedale, August 26, 1958, reared from alkali bee nesting site (HWH); Indian Cove, August 16, 1955 (DAB); Mountain Home, August 8, 1948 (AJW); Jerome, August 7, 1953 (ARG); two miles north of Hazleton, July 20, 1953 (ARG); five miles north of Aberdeen, July 30, 1954 (ARG); Acequia, June 30, 1951, on *Asclepias* sp. (WFB); Salmon, September 9, 1957, on *Chrysothamnus* sp. (HCM).

MYOPINAE

Zodion abitus Adams. Seven miles northwest of St. Anthony, July 17, 1956 (WFB).

Zodion americanum Wiedemann. Priest River Forest Exp. Station, August 14, 1958 (ARG); Athol, August 30, 1956 (WFB); Deary, August 14, 1951 (WFB); Arrow Junction in Nez Perce Co., June 14, 1951 (WFB); twelve miles south of Rock Creek in Twin Falls Co., August 1, 1951 (WFB); six miles northwest of St. Anthony, July 16, 1956 (WFB).

Zodion cinereventre Van Duzee. Hot Springs in Owyhee Co., June 28, 1953 (WFB); Boise, May 20, 1956 (ARG); 18 miles south of Twin Falls, July 21, 1958, on carrots (HWH); 10 miles west of Rock Creek Canyon Ranger Station in Twin Falls Co. (ARG); Arco, August 8, 1958 (BAF); seven miles northwest of Weston, August 3, 1958, on *Chrysothamnus* sp. (ARG).

Zodion fulvifrons Say. Chilco, July 2, 1952 (WFB); Lewiston, June 2, 1948 (AJW); Spalding, May 22, 1951, on *Achilla millifolium* L. (WFB); Orofino, June 13, 1952 (WFB); Slate Creek, September 18, 1955, on *Chrysothamnus* sp. (ARG); four miles northeast of Sweet, July 3, 1956, on *Aster* sp. (WFB); Lucky Peak Dam in Ada Co., May 20, 1956, on *Brassica* sp. (ARG); two miles west of Gardena, July 3, 1956, on *Eriogonum* sp. (WFB); Melba, June 30, 1944 (WES); Murphy, May 27, 1958, on *Chaenactis* sp. (WFB); 16 miles north of Mountain Home, June 16, 1955 (HWS); 10 miles east of Rupert, June 29, 1954 (ARG); Twin Falls, August 30, 1954 (ARG); Hansen, August 3, 1944 (WES); Buhl, August 16, 1947 (WFB); Eden, July 13, 1952, on carrots (WES); six miles south of Rock Creek in Twin Falls Co., September 15, 1955, on *Chrysothamnus* sp. (WFB); 10 miles west of Massacre Rocks in Power Co., September 8, 1954 (ARG); eight miles northwest of Mackay, July 30, 1958 (ARG); Acequia, June 30, 1951, on *Achillea millifolium* L. (WFB); six miles northwest of Aberdeen, July 9, 1957, on *Asclepias* sp. (ARG); Tetonia, July 29, 1955 (RWP).

Zodion intermedium Banks. Lewiston, May 14, 1941, July 8, 1948 (AJW); Arrow Junction in Nez Perce Co., June 14, 1951 (WFB); Gifford, June 19, 1951 (WFB); Lenore, May 27, 1948 (WFB); Rubens, June 20, 1944, on turnips (WES); Spalding, May 16, 1953 (HDN); Lake Fork, July 10, 1957, on *Lupinus* sp. (WFB); Brundage Lookout in Payette National Forest, August 10, 1953 (WFB); 13 miles east of Kilgore, July 15, 1956 (WFB).

Zodion obliquefasciatum (Macquart). Lewiston, September 5, 1958, on *Chrysothamnus* sp. (WFB); four miles northeast of Sweet, July 4, 1956 (WFB); 18 miles east of Weiser, July 26, 1956, on *Grindelia* sp. (WFB); Marsing and Homedale, many specimens during June and July from alkali bee nesting sites (HWH, WFB); Grandview, July 9, 1958 (HCM); Little Valley in Owyhee Co., August 3, 1955 (DAB); Preston, July 20, 1954 (ARG); 10 miles southwest of Leesburg, July 6, 1953 (WFB); Salmon, September 14, 1957, on *Chrysothamnus* sp. (HCM).

Zodion perlongum Coquillet. Twin Falls, August 30, 1954 (ARG); 10 miles west of Massacre Rocks in Power Co., September 8, 1954 (ARG).

Robertsonomyia parva (Adams). Albion, September 1, 1925, on *Gutierrezia sarothrae* (Pursh) Britton and Rusky (RWH).

Myopa curticornis Korber. Lewiston Grade, April 23, 1938 (HLH); Lewiston, May 1, 1948 (AJW); Lenore, May 7, 1938 (HLH); Mesa, June 6, 1952 (HCM).

Myopa longipilis Banks. Moscow, April 24, 1953 (HDN); Lenore, April 8, 16, 1949 (WFB, AJW).

Myopa melanderi Banks. Tomers Butte in Latah Co., May 2, 1953 (HDN); Spalding, April 18, 1948 (WFB); Lenore, May 7, 1938 (HLH).

Myopa perplexa Camras. Tomers Butte in Latah Co., May 10, 1953 (HDN); Montour, May 10, 1949.

Myopa rubida (Bigot). Athol, May 21, 1958, on *Prunus* sp. (ARG)); Chilco, July 9, 1949 (WFB); Lapwai, April 23, 1948 (AJW); 10 miles north of Nez Perce, June 5, 1952 (WFB).

Myopa vesiculosa Say. Moscow, April 19, 1937 (CCB); Elba-Basin Pass in Cassia Co., June 14, 1953 (TBO).

Myopa vicaria Walker. Moscow, April 4, 1953 (HDN); Joel, April 26, 1949 (WFB); Lenore, April 18, 1948 (AJW); Nez Perce, May 20, 1949 (AJW).

Occemyia loraria (Loew). Five miles west of Avery, July 13, 1958 (ARG); Moscow Mountain, August 9, November 9, 1957 (ARG); Deary, August 14, 1951, on *Hypericum perforatum* L. (WFB); Spalding, May 22, 1951 (WFB); Webb, May 15, 1951 (WFB); Winchester, July 7, 1944, on carrots (WES); Nez Perce, May 24, 1949 (AJW); Lawyers Canyon in Lewis Co., July 16, 1958 (ARG); two miles north of Melba, July 3, 1954, on carrots (HWH); Twin Falls, August 6, 1954, on *Melilotus* sp. (ARG); seven miles northwest of Weston, August 3, 1958, on *Chrysothamnus* sp. (ARG); Swan Lake in Bannock Co., August 1, 1954 (ARG).

Occemyia luteipes Camras. Gifford, June 28, 1951, on white dutch clover (WFB); McCall, July 25, 1949 (RWP); Star, July 19, 1944, on carrots (WES).

Occemyia modesta (Williston). Athol, August 30, 1956, on *Cirsium* sp. (WFB); Chilco, June 2, 1952 (WFB); Moscow Mountain, November 9, 1957 (ARG); Deary, June 10, 1951, on alsike clover (WFB); Winchester, July 7, 1944, on turnips (WES); five miles southwest of Twin Falls, August 6, 1954, on *Solidago* sp. (ARG); Bear Creek Camp in Custer Co., July 27, 1957 (WFB); Elba-Basin Pass in Cassia Co., June 22, 1959 (BAF); Grace, June 17, 1950 (RWP); seven miles northwest of Weston, July 3, 1958 (ARG).

Occemyia nigripes Camras. Moscow, August 1, 1957 (WFB);

Moscow Mountain, November 9, 1959 (ARG); Deary, August 14, 1951, on *Epilobium angustifolium* L. (WFB); Rubens, July 16, 1948, on *Hypericum perforatum* L. (WFB); Arrow Junction in Nez Perce Co., September 3, 1951 (WFB); Winchester, July 7, 1944 (WES); Parma, July 3, 1956 (ARG); 18 miles south of Twin Falls, July 21, 1958 (HWH); seven miles northwest of Weston, August 3, 1958, on *Chrysothamnus* sp. (ARG).

Occemyia propingua (Adams). Athol, March 14, 1954 (WFB); Moscow, July, 1932 (PR); Moscow Mountain, August 9, November 9, 1957 (ARG); Deary, August 14, 1951 (WFB); Spalding, May 22, 1951 (WFB); Gifford, June 26, 1951 (WFB); Rubens, July 6, 1944 (WES); nine miles southwest of Midvale, July 9, 1952, on *Phacelia* sp. (WFB); Middletown, July 19, 1944, on carrots (WES); Albion, September 1, 1925 (RWH); Oxford, July 17, 1950, on alfalfa (RWP); Stanley, August 6, 1950 (RWP); Ashton, August 2, 1945, on potatoes (WES); six miles northwest of St. Anthony, July 16, 1956 (WFB); eight miles northwest of Mackay July 30, 1958, on *Melilotus* sp. (WFB); 11 miles north of Howe, July 26, 1957 (RAM).

DALMANNIINAE

Dalmannia blaisdelli Cresson. Rubens, June 20, 1948 (AJW); Harpster Grade in Idaho Co., June 8, 1951 (WFB).

Dalmannia picta Williston. Gifford, June 2, 1950 (AJW); Nez Perce, May 24, 1949 (AJW).

Dalmannia vitiosa Coquillet. Six miles west of Athol, May 21, 1958 (WFB); Central Grade in Nez Perce Co., April 26, 1954 (DE); Albion, June 9, 1955 (WFB).

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NEW HELIOTHID MOTH FROM CENTRAL FLORIDA (LEPIDOPTERA: NOCTUIDAE)

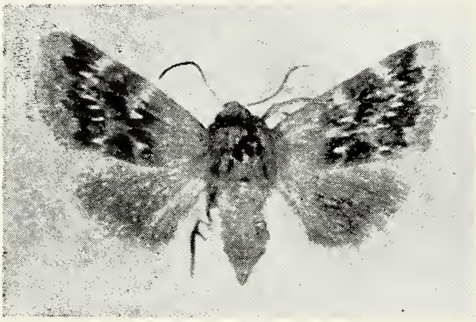
By Rowland R. McElvare, Southern Pines, N. C.

Rhododipsa fulleri, sp. n.

Head and thorax clothed with coarse hair and a few scales; orange, shading to a lighter tone on the abdomen.

Tibiae spinose. Fore tibiae short and broad, having a very long terminal spine ("claw") on the inner side with one long and one short spine above; a long terminal spine on the outer side with three shorter spines above.

Fore wings golden orange overlaid with burnt sienna and white scaling. (In one female, the sienna has deepened to indian red.) Transverse lines irregular, white. Basal area golden orange shading outward into burnt sienna. Transverse anterior line discontinuous, curved outward, marked by a whitish patch at the costa and two white dashes below. Transverse posterior line bisinuate, with whitish patch at costa, below which is a series of short white lateral dashes creating a pointed outline that gives the wing its distinctive pattern. Subterminal line clearly marked, irregularly dentate toward outer margin. Fringes orange. Due to exposure, the primaries tend to fade to a light orange, practically devoid of pattern.

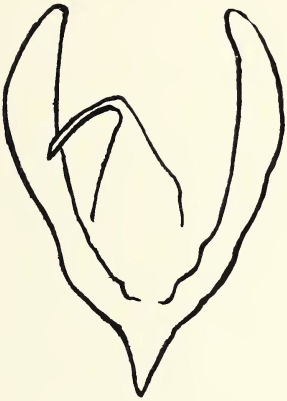


Hind wings dorsally orange, lightly overlaid with burnt sienna, which in some specimens shades into crimson. Fringes orange. Underside orange, the central area of the wings overlaid with burnt sienna to an extent varying with the specimen. Fringes orange.

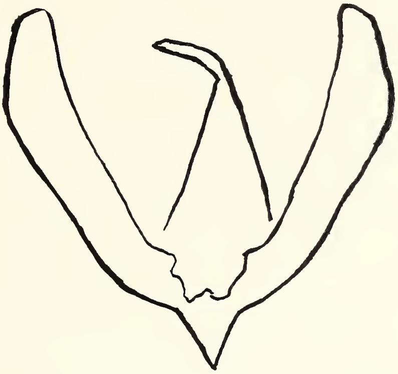
Wing expanse 18–22 mm.

Genitalia have the characteristic simplicity of the Heliothiinae. Close to *R. volupia* Fitch, they are more slender in both sexes. The harpes of *fulleri* are narrower and more rounded at the tip and the ovipositor is more slender and pointed than in *volupia.*

Comparative outlines of the harpes of both species are shown, drawn to the same scale.



R. fulleri



R. volupia

Holotype male: Oct. 22, 1960, Archbold Biological Station, Lake Placid, Fla. (Roger W. Pease, Jr.)

Paratypes: Male, Sept. 26, 1914, St. Petersburg, Fla. (R. Ludwig). Female, "Oct.", St. Petersburg, Fla. Female, Oct. 19, 1950, and male, Oct. 20, 1954, Cassadaga, Fla., at lights (Stanley V. Fuller). Female, Nov. 8, 1958, and male Nov. 4, 1959, Archbold Biol. Sta., at lights (S. W. Frost). 3 males, 2 females, Oct. 3–10, 1960, Archbold Biol. Sta. (R. W. Pease, Jr.). Female, Oct. 30, 1960, Archbold Biol. Sta. (R. R. McElvare). 3 females, Nov. 3–4, 1960, 2 miles east Lake Placid, Fla. (R. R. McElvare).

Holotype male placed in the U. S. National Museum collection, which has the type of *volupia.* Paratypes: St. Petersburg pair in U. S. National Museum collection for many years. Cassadaga specimens in collections S. V. Fuller, Cassadaga and Charles P. Kimball, Sarasota, Fla. Archbold Biol. Sta. specimens taken by S. W. Frost, in Penn. State. Univ. collection. Other specimens placed in collections of Archbold Biol. Sta., Peabody Museum of Yale, Amer. Mus. Nat. Hist., and British Museum (Natural History) which has the type of *R. volupides* Strand, now a synonym of *volupia.* Remainder in R. R. McElvare collection, Southern Pines, North Carolina.

With one exception at lights, the 1960 series from the Lake Placid region was taken on the flowers of *Actinospermum angustifolium* (Pursh) T. & G. The range of this flower is: Sandhills, pinelands and scrub, Coastal Plain, Fla., to Ga. and Miss. Spring, fall and locally all year. As the known specimens of *fulleri* are all from central Florida, its association with *Actinospermum* suggests a further search in October may extend its known range substantially.

Rhododipsa has been a western genus, ranging from Texas with *R. volupia* Fitch into California with *R. pallicincta* Sm. *Fulleri* now provides representation in the east. *Fulleri* is allied to *volupia* with which it shares the distinctive pointed edge of the t.p. line, but from which it also differs specifically. Its golden orange coloring is in sharp contrast to *volupia's* ruby wine red. It has a well-defined s.t. line either lacking or indistinct in *volupia*. In *volupia* also, the distance between the t.a. and t.p. line is extremely variable. As a result the median space ranges from about one third the width of the wing to the constriction resulting from the anastomosing of the transverse lines. In *fulleri*, the armature of the fore tibiae is slender and pointed; in *volupia*, particularly in the terminal spines, coarser and blunt. Similar contrasting slenderness in the genitalia has been noted above.

ACKNOWLEDGMENTS

In addition to those noted above who loaned material, acknowledgment should be made to:

Richard Archbold, President of Archbold Expeditions, for his courtesy in making available facilities of the Archbold Biological Station.

Leonard J. Brass, Amer. Mus. Nat. Hist.. botanist at the Archbold Biol. Sta., for advice on the local occurrence of *Actinospermum* which resulted in finding a new colony of *fulleri* east of Lake Placid village, some twelve miles from that at the Station.

Charles P. Kimball, Sarasota, Fla., for referring to me specimens taken by Fuller and Frost that evidenced the continued existence of this moth after a lapse of many years since the U.S.N.M. specimens were taken at St. Petersburg.

Roger W. Pease, Jr., New Britain, Conn., for field collecting and discovering the association of *fulleri* with *Actinospermum*.

REVIEW OF THE LIMATULUS-SETOSUS GROUP OF THE GENUS ENDALUS IN AMERICA NORTH OF MEXICO (COLEOPTERA: CURCULIONIDAE)[1]

By Horace R. Burke[2]

While studying the curculionid fauna of Texas it was found that at least seven of the eight species of *Endalus* Laporte known from America north of Mexico occur in the State. Study of these local species along with the discovery of some apparently reliable taxonomic characters not previously used prompted this review of a portion of the genus with descriptions of two new species. Future plans include a more complete treatment of the entire genus.

Sincere appreciation is expressed to the following persons for loan of material and for other favors: Miss Rose Ella Warner, Entomology Research Division, U.S.D.A., (U.S. National Museum); Dr. Henry F. Howden, Canada Department of Agriculture, (Canadian National Collection); Dr. Leland Chandler, Purdue University; and Dr. Vasco M. Tanner, Brigham Young University. Additional specimens for study consisted of those in the collection of the Entomology Department, A. & M. College of Texas, and in the author's collection.

The genus *Endalus* Laporte 1840, in America north of Mexico, has received little attention since the treatment by LeConte (1876) of six species, five of which he described as new at that time. Blatchley (1916) dealt with those species occurring in north eastern America and described an additional new one from Florida. Tanner (1943) presented a key to the species known from America north of Mexico.

Little is known concerning the biology of members of *Endalus* except that they are usually found on plants around water. Available records indicate that at least three species are definitely associated with plants of the genus *Scirpus*. A few species have been taken in numbers at lights.

Endalus in America north of Mexico may be readily separated into two rather distinct groups. Although the conservative approach of considering these as species groups is followed here, study of additional material, especially South American species, may well prove that these groups deserve subgeneric status. These two groups may be separated as follows:

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[2] Assistant Professor, Department of Entomology.

(1). *Limatulus-setosus* Group. Paired, pad-like scales (Figs. 5, 6) between tarsal claws; second tarsal segment at most only slightly wider than first, the two usually equal in width; tarsal claws widely divergent, moderately separated at base; eyes rounded, height of eye always distinctly less than two times width; length, 2.5–5.5 mm.

(2). *Ovalis-laticollis* Group. Without pad-like scales between tarsal claws; second tarsal segment distinctly wider than first; tarsal claws never widely divergent, narrowly separated at base; eyes transverse, height of eye usually about two times width; length, 1.4-2.8 mm.

A review of the *limatulus-setosus* Group is the subject of the present study. The *ovalis-laticollis* Group, containing *Endalus ovalis* LeConte, *E. punctatus* LeConte, and *E. laticollis* Blatchley, will be treated later when more material is available and when a study can be made of the type series of each. This latter group at present is in a rather confused state, with probably no less than five good species being included under the three names now recognized.

All species of the *limatulus-setosus* Group possess paired, pad-like scales between the bases of the claws on the ventral side of the fourth tarsal segment. A search of the literature has failed to reveal previous mention of these rather conspicuous scales in *Endalus,* or in any other curculionids. These scales of *limatulus, robustus* and *disgregus* n. sp. are somewhat elongate with plumose margins and may be either separated or contiguous. In some examples the two median scales are flanked laterally by shorter ones, while in others the lateral scales are absent. The latter condition is apparently brought about by rubbing since poorly preserved specimens have been examined which lacked all of the scales on one or more tarsi. Rose Ella Warner (*in litt.*) has informed me that the type of *robustus* has paired scales on the fore and middle tarsi, but only a straight row of scales on the hind tarsi. All other species of the *limatulus-setosus* Group have paired scales on all tarsi. *Endalus setosus, aeratus, cribicollis* and *celatus* n. sp. have oval scales which are much more conspicuous than the elongate ones described for the three species above.

Additional characters common to all species of the *limatulus-setosus* Group are: Rostrum rather stout, slightly to moderately curved; scrobes short, descending to reach underside of rostrum some distance before eyes; suprascrobal groove extending from above antennal insertion posteriorly to open against front margin of eye. Antennae slender; scape gradually enlarged in apical third, not reaching eye; funicle 6-segmented, segment 1 obconical, segment 2 shorter, slender, segments 3–6 each shorter than 2, all approximately equal in length and becoming progressively broader toward club; club elongate-oval. Eyes coarsely faceted. Prothorax wider than long (except *celatus*). Humeri prominent, rounded. Elytra emarginate at base, distinctly wider than prothorax, apex broadly rounded to somewhat obtusely pointed. Fore coxae contiguous. Abdominal sterna 1 and 2 approximately equal in length, first suture broadly arcuate at middle, sterna 3 and 4 shorter, equal in length, sternum 5 along midline as long as 3 + 4. Tibiae each with a preapical tooth and a stout apical spine. Tarsal segment 3 deeply emarginate, segment 4 usually projecting slightly past lobes of 3.

All measurements reported herein were made with an ocular micrometer. The length of the rostrum was measured from a side view along a straight line from the apex of the rostrum to the point where it joins the underside of the head. The total length of the body was determined from a dorsal view by measuring along the midline from the anterior margin of the eye to the apex of the elytra. All other measurements were made at the point of greatest width or length of the structure in question.

KEY TO SPECIES OF THE LIMATULUS-SETOSUS GROUP IN AMERICA NORTH OF MEXICO

1. Setae on head, prothorax and elytra long, conspicuous; prominent swelling at base of rostrum before eyes (Fig. 1) *celatus,* n. sp.
   Setae on head, prothorax and elytra short, at most only moderately conspicuous; without swelling at base of rostrum .. 2
2. Prothorax with lateral edges expanded (Fig. 2) *setosus* LeConte
   Prothorax more rounded in cross section 3
3. Paired, pad-like scales between tarsal claws oval (Fig. 6); hind tibia never denticulate along inner margin; length, 2.1–3.2 mm. 4
   Paired, pad-like scales between tarsal claws elongate, with plumose margins (Fig. 5); hind tibia (except *robustus*) with a few stout denticles along inner margin; length, 3.6–5.5 mm. 5
4. Eyes large in comparison to size of head (Fig. 4); rostrum of both sexes short; elytral setae stout, abundant; elytral scales brassy in color .... *aeratus* LeConte

Eyes small in comparison to size of head (Fig. 3); rostrum of female longer; elytral setae remote, inconspicuous; elytral scales gray and brown, never brassy ... *cribicollis* LeConte

5. Prothorax densely, finely punctate; rostrum rather slender, moderately curved; hind tibia with a few stout denticles along inner margin (these denticles may be entirely hidden by scales) 6

Prothorax coarsely punctate; rostrum stout, scarcely curved; hind tibia without row of denticles along inner margin *robustus* Schaeffer

6. Third tarsal segment distinctly wider than second; tarsal claws stout; length, 4.5–5.5 mm. .... *limatulus* (Gyllenhal)

Third tarsal segment more slender, only slightly wider than second; tarsal claws slender; length, 3.6 mm. *disgregus,* n. sp.

Endalus celatus, n. sp. (Figure 1)

Holotype male: Length, 2.6 mm.; width, 1.1 mm.; width of pronotum, 0.74 mm.; length of pronotum, 0.74 mm.; length of rostrum, 0.59 mm.

Elongate-oval; derm of body and appendages reddish-brown, covered by dense coating of brown scales and long, slender, inclined to recurved setae.

Rostrum straight, tapering slightly from base to apex, with dorsal prominence at base before eyes; closely, coarsely punctate except for smooth, shining apex; basal two-thirds of rostrum covered by coat of dense scales which do not completely obscure punctation; conspicuous, bristle-like setae along dorsal surface of rostrum arranged in four poorly defined longitudinal rows, each lateral row extends onto front of head along upper anterior margin of eye. Suprascrobal groove only feebly evident, almost completely covered with scales *Antennae* inserted immediately before middle of rostrum; funicular segment 1 stout, as long as next three segments combined, segment 2 shorter, approximately as long as 3 + 4, segments 3–4 equal in length, becoming slightly broader toward club; club large, obtusely pointed at apex, almost as long as funicle. *Eyes* oval, very feebly convex. *Prothorax* rounded in cross section, as long as wide; sides slightly diverging from base to widest portion just before middle, thence rounded to feeble subapical constriction; pronotum with coarse, contiguous punctures evident through the dense coating of scales; slender, inclined to recurved setae on pronotum with apices generally turned inward toward midline. *Scutellum* oval, small and inconspicuous. *Elytra* 1.4 times wider, 2.3 times longer than prothorax; humeri rounded; sides of elytra parallel in basal three-fifths, thence converging to rounded apex; dense coating of elytral scales are brown except for a white spot of scales at base of intervals 4 and 5 and on suture at beginning of declivity; intervals convex, transversely rugose, each bearing a single row of long setae, each seta being erect in its basal half then strongly bent, the apices of all elytral setae projecting posteriorly; striae wide, deeply impressed throughout. *Underside* clothed as above except that brown color is somewhat mottled with gray. Femora and tibiae slender, bristling with long, gray setae which are less strongly curved than those on body. Tarsi stout, squamose, setose, with pair of oval, pad-like scales between claws at apex of last tarsal segment. Tarsal claws stout, widely divergent.

Type material: Holotype male, College Station, Brazos Co., Texas, 20 April 1960 (H. R. Burke), to be deposited in Collection of Entomology Department, A. & M. College of Texas. This specimen was taken while sweeping sedges and other plants at the edge of a pond. Extensive collecting in the same area before and after the capture of this specimen failed to produce additional material.

Remarks: Endalus celatus is a very distinctive species and may be readily separated from any known member of the genus by the prominent setae on the body. This new species is most closely related to *aeratus* which it resembles in several respects. Other than the prominent setae mentioned above, the two may be separated by the smaller and less convex eyes, and the dorsal prominence at the base of the rostrum (lacking in *aeratus*) of *celatus*. In addition, *celatus* lacks the brassy scales characteristic of *aeratus*.

Endalus aeratus LeConte

Endalus aeratus LeConte, 1876, p. 176.

Length, 2.4–3.2 mm.; width, 1.0–1.3 mm.

This species is rather easily recognized by the brassy color of the elytral scales; no other known species of *Endalus* has scales of this color. However, the extent of the brassy tint varies somewhat, being more evident in some specimens than in others. Other distinctive characters for *aeratus* include large, rounded eyes, coarsely punctate prothorax, and stout rostrum. *Endalus aeratus* is definitely more closely related to *setosus* and *celatus* n. sp. than to other members of the *limatulus-setosus* Group. This affinity is evident in the possession by all three of oval, pad-like scales between the tarsal claws, the very widely divergent claws (much more so than in other members of the group), the narrow lobes of the third tarsal segment, and the more abundant setae on the body.

Records taken from label data indicate that *aeratus* has been occasionally collected on a variety of plants such as cotton, willow, carrots, alfalfa and beets. Material obtained for study from the U. S. National Museum included an envelope containing 54 specimens and labeled in part "Woodland, Calif., swept from *Scirpus fluviatilis*". The large number of specimens taken from this particular species of plant strongly indicates that it represents at least one of the true hosts of *aeratus*.

Endalus aeratus was described from Texas and is now known to be widely distributed west of the Missisippi River. A total of 122 specimens has been examined from the following localities: *United States.* CALIFORNIA—Downey; 20 mi. S. Fresno; Sacramento; Woodland. COLORADO—Alamosa. IDAHO—Caldwell. KANSAS—Hamilton Co. NEVADA—Elko. OREGON—Portland; Hood River. TEXAS—Brazos Co.; Brownsville; Cameron Co.; Dimmit Co.; Donna; Floyd Co.; Gillespie Co.; Lubbock; Lynn Co.; Pharr; San Benito; San Diego; Taft; Zavala Co.; Nueces River. *Canada.* ALBERTA–Lethbridge.

Endalus setosus LeConte

Endalus setosus LeConte, 1876, p. 176; Blatchley and Leng, 1916, p. 223.

Length, 3.5–5.0 mm.; width, 1.5–2.2 mm.

The expanded lateral edges of the prothorax (Fig. 2) and abundant, recurved setae on the body are distinctive features of this species. The sexes are easily distinguished by the color pattern on the elytra. In the male the scales on each elytron are rather uniformly brown from the suture through interval 8, gray on intervals 9, 10, 11, with a white spot of scales at base of interval 4 and on suture at middle of length of elytra. The general color pattern of the elytra of the female consists of dark brown scales on the basal third of intervals 2 and 3, behind which is a broad, rather vague V-shaped pattern with an arm extending diagonally forward across first six intervals of each elytron. The scales elsewhere on the elytra are light brown or gray except for white ones in a spot at the base of interval 4, on suture near beginning of declivity, and sometimes in scattered spots on intervals.

Although *setosus* is frequently collected around lights in Texas, nothing is known concerning its biology.

It should be noted here that the last paragraph of LeConte's description of *setosus* actually belongs with *limatulus*, (LeConte, 1876, Appendix, p. 417). Therefore, the statement by LeConte concerning distribution "Middle States not rare; Kansas, Texas" refers to *limatulus* and not *setosus.* I have not seen specimens from localities other than in Texas and Louisiana. Sixty-two specimens, including the type in the Museum of Comparative Zoology, have been examined from the following localities in these two states: TEXAS—Anderson Co.; Brazos.; Brownsville; Cotulla; Cuero; Hidalgo Co.; Kingsville; Taft; Weslaco; Winter Haven. LOUISIANA—"La.".

Endalus cribicollis LeConte

Endalus cribicollis LeConte, 1876, p. 177; Blatchley and Leng, 1916, p. 224.

Length, 2.1–3.0 mm.; width, 0.9–1.3 mm.

Endalus cribicollis is not common in collections. The outstanding characters of this species are the small eyes, very coarsely punctate prothorax and the slender rostrum of the female. The eyes (Fig. 3) are much smaller in comparison with the size of the head than those of any other species of the *limatulus-setosus* Group. *Cribicollis* has oval, pad-like scales between the tarsal claws like those of *setosus, aeratus* and *celatus* n. sp. but differs from these three species in having remotely placed, very inconspicuous setae on the elytra. In this latter respect and in general appearance, *cribicollis* more closely resembles *limatulus, robustus* and *disgregus* n. sp.

Specimens of *cribicollis* have been collected by sweeping vegetation around water. One specimen seen from Kansas was collected on alfalfa.

Endalus cribicollis was described from Georgia. Blatchley (1916) reports the species from District of Columbia. A total of 10 specimens from the following localities has been examined: GEORGIA—type (Museum of Comparative Zoology). KANSAS—Riley Co. WYOMING—Cheyenne. TEXAS—College Station; Dallas; Gillespie Co.

Endalus limatulus (Gyllenhal)

Notiophilus limatulus Gyllenhal, 1836, p. 319.

Endalus limatulus, Laporte, 1840, p. 339; Leconte, 1876, p. 176; Blatchley and Leng, 1916, p. 224.

Length, 4.5–5.5 mm.; width, 2.0–2.5 mm.

This is the most widely distributed member of the *limatulus-setosus* Group in America north of Mexico. Examples of this species exhibit considerable variation in size, length of rostrum, and degree of tapering of the apices of the elytra. Two Iowa specimens from the U. S. National Museum series have the rostrum more slender and longer, and the elytra more distinctly tapered apically than in any other specimens of *limatulus* examined. However, this variation does not appear to exceed that to be expected for such a widespread and rather variable taxon.

Tanner (1943) reports collecting *limatulus* on *Scirpus acutus* and *Typha latifolia* in Utah. The two Iowa specimens mentioned above each bears the pin label "*Scirpus acutus*", and at least one of these was reared from this plant. One specimen seen from Georgia is labeled "on *Aeschynomene virginica* stem" and another from North Carolina "on *Scirpus americanus* foliage". Bleasdell (1937) cites a report of *limatulus* ovipositing on *Juncus* sp. in Iowa.

The type of this species has not been located and there is considerable doubt that it is extant. It is not in the Gyllenhal collection at the Zoological Institute, Uppsala, Sweden.

Seventy-two specimens of *Endalus limatulus* have been examined from the following localities: *United States.* ARIZONA—Tucson; Douglas. COLORADO—Greely. GEORGIA—Richmond Hill. IDAHO—Parma. ILLINOIS—Buda. INDIANA—Whitley Co.; Lake Co. IOWA—Palo Alto Co.; Iowa Co.; Arnold's Park. KANSAS—Riley Co. MARYLAND—Chesapeake Beach. MICHIGAN—Detroit. MINNESOTA—Albert Lea. NEVADA—Humboldt L. NEW JERSEY—Irvington. NEW MEXICO—Albuquerque. NEW YORK—Staten Island; Bellport, L. I. NORTH CAROLINA—Ft. Fisher; Swan Quarter. OKLAHOMA—Norman. TENNESSEE—Knoxville. TEXAS—Gillespie Co. UTAH—Utah Lake, East side; St. George; Richfield. VIRGINIA—Hampton; nr. Cole Pt. *Canada.* ALBERTA—Medicine Hat. MANITOBA—Strathclair. ONTARIO—Pt. Pelee; Pr. Edward Co.

Endalus disgregus, n. sp.

Holotype male: Length, 3.6 mm.; width, 1.4 mm.; width of pronotum, 1.1 mm.; length of pronotum, 0.96 mm.; length of rostrum, 0.81 mm.

Elongate-oval; derm black, fourth tarsal segment and apex of rostrum reddish, scape and first two segments of funicle testaceous, remainder of antenna distinctly darker; dense coating of scales on body predominately gray, with darker scales forming faint patterns on pronotum and elytra.

Rostrum moderately curved, depressed and slightly widened toward apex; covered with dense coating of scales in basal two-thirds; punctation coarse at base, becoming finer apically, apex of rostrum shining, remotely and very finely punctate. Antennae inserted slightly behind middle; funicular segment 1 stout, approximately as long as next three segments combined, segment 2 almost as long as 3 + 4, segments 3–6 nearly equal in length, becoming progressively broader toward club, last two segments rather densely squamose. Club as long as preceding five funicular segments combined. *Eyes* broadly oval, slightly convex. *Prothorax* wider than long (30:26); sides evenly rounded, feebly constricted before apex; pronotum finely, densely punctate, with faint pattern of scales consisting of a median light gray area enclosed by darker, broad sublateral vittae, scales on lateral margins grayish. *Scutellum* small, densely covered with white scales. *Elytra* about 1.3 times wider, 2.4 times longer than prothorax, transversely depressed on disc at basal third; humeri rounded; sides of elyra parallel to about middle, thence converging to obtusely pointed apex; apices acuminate, divaricate; intervals flat, finely punctate, each bearing a feebly defined row of white, short, recurved setae; striae narrow, deeply impressed; scales brownish for a short distance at bases of intervals 2 and 3, in a spot behind humeri, in a vague V-shaped pattern at middle of elytra, and on declivity; scales elsewhere dirty gray. *Underside* covered with dense coating of gray scales which are lightly tinted with scattered spots of light brown; distinct concavity in middle of first abdominal sternum, fifth sternum with shallow oval depression in center. Femora and tibiae rather stout, tibiae each with a row of a few stout denticles along inner margin. Tarsal segment 3 slightly broader than 2; pad-like scales between claws elongate, plumose; tarsal claws slender, widely divergent.

Type material: Holotype male, OREGON, 10 mi. N. W. Klamath Falls, "in swamp", 16 June 1952, No. 54-10685 (V. Roth); and one male paratype, OREGON, Narrows, 1 July 1906, no other data. The paratype specimen closely resembles the holotype. It measures 3.5 mm. in length and 1.4 mm. in width. Both specimens are to be returned to the U. S. National Museum.

Remarks: This species closely resembles *limatulus* from which it may be separated by the narrower third tarsal segment, the more slender tarsal claws, and the smaller size. One damaged female from Carson, Nevada, in the U. S. National Museum series keys to *disgregus* on the basis of the narrow third tarsal segment. It differs from this species in being somewhat larger and having the elytra more strongly tapered toward the apex. This specimen is possibly the female of *disgregus,* but its identity must remain in question until additional examples are available for study.

Endalus robustus Schaeffer

Endalus robustus Schaeffer, 1908, p. 217.

I have not examined specimens of *robustus,* a species apparently known only from the type material collected at Brownsville, Texas. The type is in the U. S. National Museum. Schaeffer's statement concerning the comparison of *robustus* with *limatulus* is as follows: "This species has a shorter elytra than the male of *limatulus,* a different shaped and more strongly punctate prothorax, a stouter, flatter beak and more widely separated eyes".

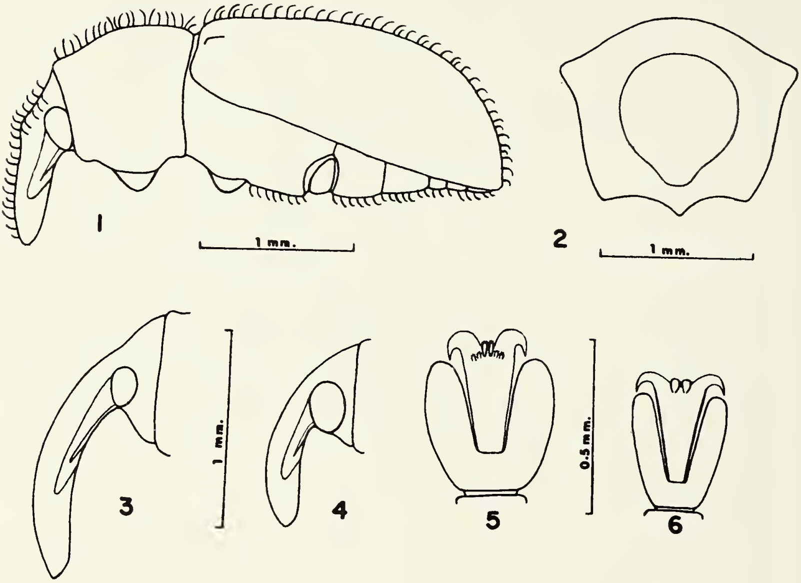

Fig. 1, Lateral outline of *Endalus celatus,* n. sp., holotype male. Fig. 2, Front view of prothorax of *E. setosus* LeConte, head removed. Fig. 3, Lateral view of head and rostrum of *E. cribicollis* LeConte, female. Fig. 4, Same of *E. aeratus* LeConte, female. Fig. 5, Ventral view of apical tarsal segments of *E. limatulus* (Gyllenhal) showing pad-like scales between claws. Fig. 6, Same of *E. setosus* LeConte.

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A SIMPLE METHOD FOR PREPARING UNIFORM MINUTEN-PIN DOUBLE MOUNTS

By B. V. Peterson, J. W. McWade and E. F. Bond[1]

There are many advantages to using minuten pins for mounting small Diptera, or other small insects, in place of triangular points or the attachment of specimens to larger pins by some adhesive material. Uniform minuten-pin double mounts of a relatively small size are more useful and aesthetically pleasing than those of the usual array of various shapes and sizes.

We found the following procedure for preparing uniform and consistently neat minuten-pin double mounts both rapid and simple. We first cut discs, 5.0 mm. in diameter, from ⅛″-thick sheet cork with an eyelet punch (Fig. 1). No. 2 insect pins are then pushed through the center of each disc with pinning forceps. The cork discs will be automatically aligned at the proper height on the pins if the discs are placed on the uppermost stage of an in-

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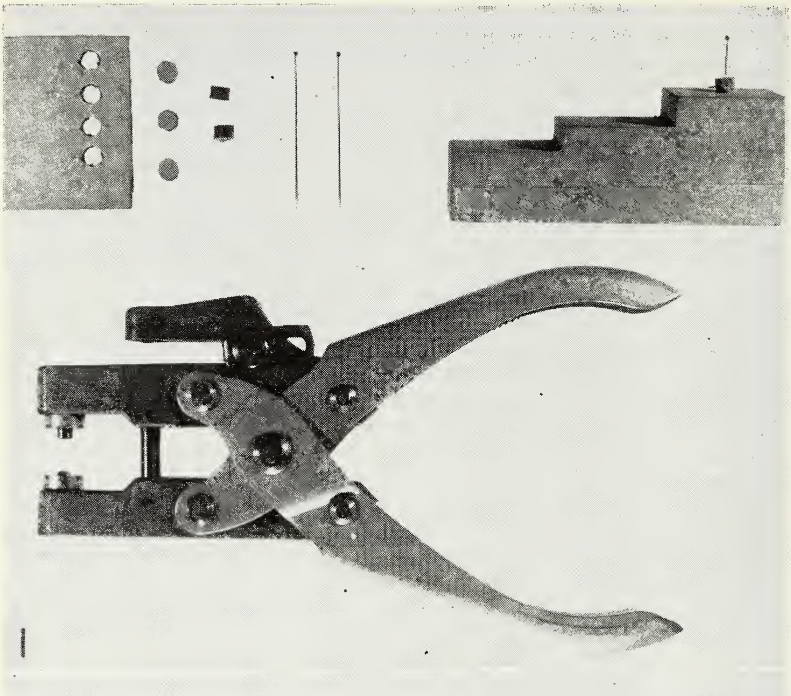
[1] Entomologist, Technician and Assistant Technician, respectively, Entomology Laboratory, Canada Department of Agriculture, Guelph, Ontario.

Peterson, McWade and Bond



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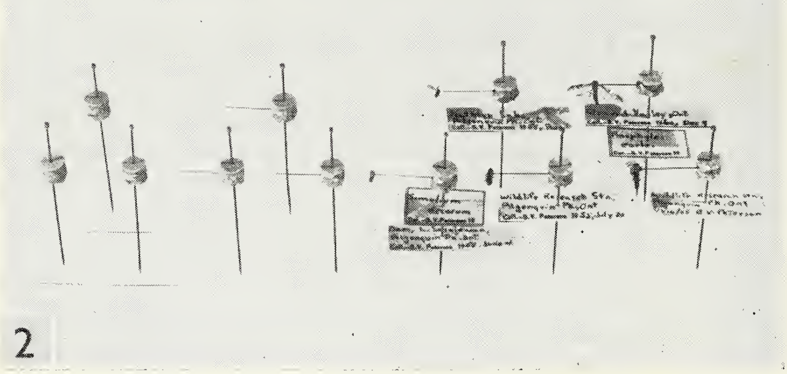

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Fig. 1, Material and equipment used for the preparation of minuten-pin double mounts (refer to text for details). Fig. 2, minuten-pin double mounts before insertion of the minuten pins (left); after insertion of the minuten pins (center); and with mounted specimens (right).

sect pinning block. The 5.0 mm. discs do not obscure the labels to any appreciable extent (Fig. 2); however, smaller discs can be made by using a finer eyelet punch and thinner sheet cork. If smaller discs are used, there is the danger of the cork fragmenting, both when the discs are cut and when the insect pins are forced through them.

The pointed end of the minuten pin is pushed into the cork disc at right angles to the No. 2 pin with dissecting forceps and forced out the other side. Some care is needed in this step because the minuten pins bend very easily. When the minuten pin is pushed through the cork so that the blunt end is flush with the disc, a 4.0–5.0 mm. length of the pin shaft should be embedded in the cork as an anchor, and 5.0–8.0 mm. should project beyond the cork; the latter figure will vary with the length of the minuten pin. With practice, complete double-mounts can be prepared at the rate of approximately 75 per hour.

To mount the specimen, the insect is placed in the desired position, and the minuten pin is inserted. The position of the freshly killed or thoroughly relaxed specimen can then be adjusted before the insect hardens.

We have used these pins for mounting mosquitoes, black flies, and other small Diptera, and find our collections are much neater because of the uniformity of these pins.

The material and equipment needed for the preparation of the double mounts are minuten pins, No. 2 insect pins, pinning forceps, dissecting forceps, ⅛″ sheet cork and a 5.0 mm. eyelet punch (we use the Velos No. 950 punch). The eyelet punch is a parallel-jawed paper punch which delivers smoother, less compressed discs than does the snip-action type. This, or a comparable punch, should be available from any office supply company.

PUBLICATIONS RECEIVED

A manual of Common Beetles of Eastern North America, by Eliz. S. and L. S. Dillon, 883 pp., 544 text figs., plus 81 plates, 5 × 8 inch pages, clothbound. 1961. Row, Peterson and Co., Evanston, Ill. The first relatively comprehensive beetle manual to appear in 50 years. The species covered make up 90 per cent of the beetles likely to be encountered in Eastern North America. Keys to families and full descriptions of each family, genus, and species are included. This book is intended for the casual naturalist, the amateur collector, the serious student, and the professional who needs a ready reference work. (List price, $9.25).

THE MALE OF MARTYRINGA RAVICAPITIS (LEPIDOPTERA: OECOPHORIDAE)

By Ronald W. Hodges[1]

Two male specimens of *Martyringa ravicapitis* Hodges were found in some unincorporated material in the Cornell University Collection. It seems advisable to illustrate the male genitalia and to point out the distinguishing features which separate the species from *M. latipennis* (Wlsm.). The species was described on the basis of two females (Hodges, 1960, Bul. Brooklyn Ent Soc. 55: 81–83.)

The male genitalia of *M. ravicapitis* (Figs. 1 and 2) differ from those of *M. latipennis* (Clarke, 1941, Proc. U. S. Natl. Mus., 90, no. 3107: pl. 9, fig. 72) in the following points: The valves of *ravicapitis* are broader at the base than are those of *latipennis;* the sacculus of *ravicapitis* is more heavily sclerotized than that of *latipennis;* and the distal portion of the sacculus of *ravicapitis* is slightly produced and sclerotized, whereas this area is not set off in *latipennis.*

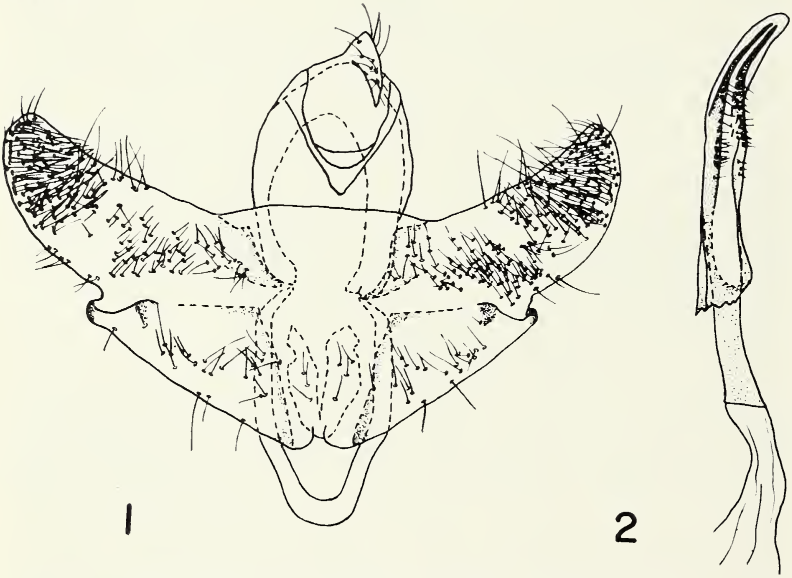

Fig. 1, *Martyringa ravicapitis* Hodges, ventral view of male genitalia (R.W.H. slide no. 857). Fig. 2, *ravicapitis,* ventrolateral view of aedeagus (R.W.H. slide no. 857).

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[1] Department of Entomology, Cornell University, Ithaca, New York

Grateful acknowledgment is made to the Grace H. Griswold Fund of the Department of Entomology of Cornell University for assuming the expense of engraving the plate.

SOME OBSERVATIONS AND PREY RECORDS OF POMPILIDAE (HYMENOPTERA) FROM NORTH-EASTERN UNITED STATES

By Frank E. Kurczewski[1]

The following observations and prey records were made during the summer of 1960 while studying under Dr. Howard E. Evans who was kind enough to read the manuscript critically and check any doubtful wasp determinations. Prey spiders were determined by Dr. W. J. Gertsch, Dr. B. J. Kaston and Dr. H. Levi whose names appear in brackets with their respective identifications.

Of the observations made, those of two females of *Ageniella semitincta* (Banks) from a sand pit in Ithaca, New York, are most noteworthy in that, aside from representing one of the few prey records for this species, the above locality is outside the *semitincta* known range.

Subfamily Pepsinae

Priocnessus nebulosus (Dahlbom), (Ithaca, New York, August 5). This medium-sized black wasp was seen straddling its spider, an immature female *Agelenopsis potteri* Blackwall [det. W. J. Gertsch], while remaining motionless on top of a large leaf near the edge of a path through a wooded area.

Priocnemis cornica (Say), (Groton, New York, August 26). One of these small black wasps was observed dragging its spider, an immature *Pardosa milvina* Hentz [det. W. J. Gertsch], backwards over a gravelly bank grasping the spider by a hind leg.

Phanagenia bombycina (Cresson), (Ithaca, New York, July 10). This wasp was seen carrying its spider, a female *Lycosa avida* Walckenaer [det. H. Levi], with all legs amputated, very rapidly across the bottom of a steep, sandy bank. The wasp straddled the spider, which was dorsum up, and grasped it by the base of the right chelicera. In carrying the spider, the wasp walked rapidly forward occasionally making short, erratic flights using the wings which produced a loud buzzing sound. The wasp with its prey underneath rested several times under leaves and other debris and had to be constantly prodded to resume its course. Both were placed in a killing jar when the wasp encountered difficulty climbing the steep grade of the bank and after several hours the wasp still retained its grasp of the spider's chelicera.

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[1] Department of Entomology, Cornell University, Ithaca, New York.

Auplopus architectus architectus (Say), (Meadville, Pennsylvania, June 1). This small wasp with a greenish blue iridescence flew onto a small shrub in a garden with its spider, a *Clubiona sp.* [det. B. J. Kaston] in the penultimate instar. The wasp held the spider venter up grasping it by the spinnerets. All eight legs of the spider had been amputated.

Ageniella semitincta (Banks), (Ithaca, New York, July 24). At noon of the above date this wasp which is black with a bright red abdomen was observed straddling its spider, a penultimate instar male *Agelenopsis potteri* Blackwall [det. W. J. Gertsch], with all legs amputated, dorsum up and carrying it forward through dense grass near the upper rim of a sand pit.

Subfamily Pompilinae

Episyron quinquenotatus quinquenotatus (Say). This common species was found nesting at the following localities; four miles west of Presque Isle State Park, Pennsylvania, on June 19, using a female *Aranea patagiata* Clerck [det. W. J. Gertsch] and two immature females of *Aranea cornuta* Clerck [det. W. J. Gertsch] and on June 26, using a female and penultimate instar male *Aranea cornuta* Clerck [det. W. J. Gertsch]; Presque Isle State Park, Pennsylvania, on June 8, using a female and male *Epeira displicata* Hentz [det. B. J. Kaston] and on June 26, using a female *Aranea cornuta* Clerck [det. W. J. Gertsch]. The observations made do not differ greatly from those of other workers in the field but the following exception is worthy of note. One interesting case of brigandage was observed in which one female wasp stole from another a spider hidden under a piece of driftwood. It then proceeded to walk rapidly backwards with its prey for a distance of approximately forty yards up a steep bank covered with thick vegetation. Instead of grasping the spider by the base of a hind leg or a hind leg, as is usually the case in this species, this particular wasp grasped the spider by the base of one pedipalp.

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STUDIES ON THE PLECOPTERA OF NORTH AMERICA: VIII.[1] THE IDENTITY OF THE SPECIES OF PARACAPNIA[2]

By John F. Hanson, Amherst, Mass.

During the summer of 1960 it was my good fortune and pleasure to go to Oxford in England to study the types of one of our two American species of *Paracapnia*. My pleasure was reduced, however, upon discovering that *Paracapnia curvata*, 1946, a species which I had described earlier, must fall into synonymy under *P. opis* (Newman), 1839.

The name *opis* lay unused and the species unrecognized for ninety-nine years after the original description. After studying the types of *opis* at Oxford, Ricker (1938) declared this species to be identical with what Needham and Claassen in their monograph (1925) called *vernalis* Newport. Apparently, Claassen had previously studied the types of *opis* (see Ricker, 1938, p. 135) and had come to the same conclusion. However, the Needham and Claassen drawings are inadequate and Ricker made none at all. Thus, Frison in 1942 and myself later (1943, 1946) expressed some skepticism concerning the identity of the species. Frison's conviction that there was only one Eastern North American species simplified the problem in his mind, and he described and figured some Illinois specimens as *opis*.

Since the distinctive male genital features were clearly recognizable in Frison's drawings and since it was unlikely that I would

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[1] Part VII appeared in the April 1960 issue of this journal. The title was inadvertently incomplete as to part number.

[2] Supported by NIH Grant E-1442(C5), U. S. Public Health Service. Contribution No. 1343 from the entomological laboratory of the University of Massachusetts, Amherst, Mass.

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get a chance to study the types of *opis* at Oxford in the near future, it seemed appropriate to accept his fine description so that both species of *Paracapnia* could be made available in the biological literature. Thus, in 1946 I described *P. curvata* as a new species quite different from the one figured by Frison in 1942. Unfortunately, the present study has shown his choice to have been wrong: i.e., the male type specimen of *opis* is not conspecific with the *opis* of Frison. As a result of this confusion, *P. curvata* becomes a synonym of *P. opis* and a new name must be applied to the species generally called *opis*.

To add to the confusion, my recent studies of the lectotype of *vernalis* in London have shown that this is a species of *Capnia* and not a *Paracapnia,* and thus is quite different in many details from what Needham and Claassen (1925) interpreted as *vernalis.* A study of the Needham and Claassen (1925, p. 385) drawings of the wings and genitalia of *vernalis* is convincing evidence that these authors were dealing with a *Paracapnia,* not a *Capnia,* although it is not quite clear which species of *Paracapnia* they illustrated. It is extremely probable that the published collection data under *vernalis* and *opis* represent a mixture of the two species of *Paracapnia* since these are sympatric over much of their ranges. All of the specimens studied by Needham and Claassen, Frison, and Ricker should therefore be reclassified.

It is the purpose of the present paper simply to clarify the identity of the two species of *Paracapnia.*

Paracapnia opis (Newman)

Chloroperla opis Newman, 1839, Mag. Nat. Hist. 3: 89 (♂♀ types in Hope Collection, Pitt Rivers Museum, Univ. of Oxford, England).

Capnia vernalis, Needham and Claassen, 1925, The Plecoptera or stoneflies of America North of Mexico, pp. 256–7, 2 questionable figs. of ♂♀ (in part?; not Newport, 1848).

Capnia opis, Ricker, 1938, Trans. Roy. Canad. Inst., vol. 22, pt. 1, no. 47, pp. 134–5 (in part?).

Capnia opis, Frison, 1942, Bul. Illinois Nat. Hist. Survey 22(2): 264–5 (not Newman, 1839; collection data in part).

Paracapnia curvata Hanson, 1946, Amer. Midl. Nat. 35: 237–8, fig. 53 (*New Synonymy*).

Types.—The two types at Oxford are not still in good condition. Some of the wings of both, the venation of which was described in detail by Ricker (1938), seem to have been lost. The male specimen has only the basal portion of the right front wing remaining, and in the female the right front wing is missing. The museum attendant felt very certain that the wings are no longer in existence. The abdomens of both type specimens are mounted in balsam and affixed to the pins bearing the head and thorax. The latter are glued to a paper point, concealing critical diagnostic sternal thoracic characters. The supraanal process of the male, as was mentioned by Ricker, is damaged: it is distorted and split wide open at the basal curvature and even the remaining distal region is slightly split so that its shape is difficult to determine. The notch mentioned by Ricker in 1938 on the subgenital plate of the female is not natural. Under the high power of the stereoscope it can be seen to have a ragged edge such as might be produced by buffalo beetle feeding. Judging by the penmanship and the method of mounting, it appears that Dr. Kimmins of the British Museum prepared these fine balsam mounts to properly preserve and protect the remains.

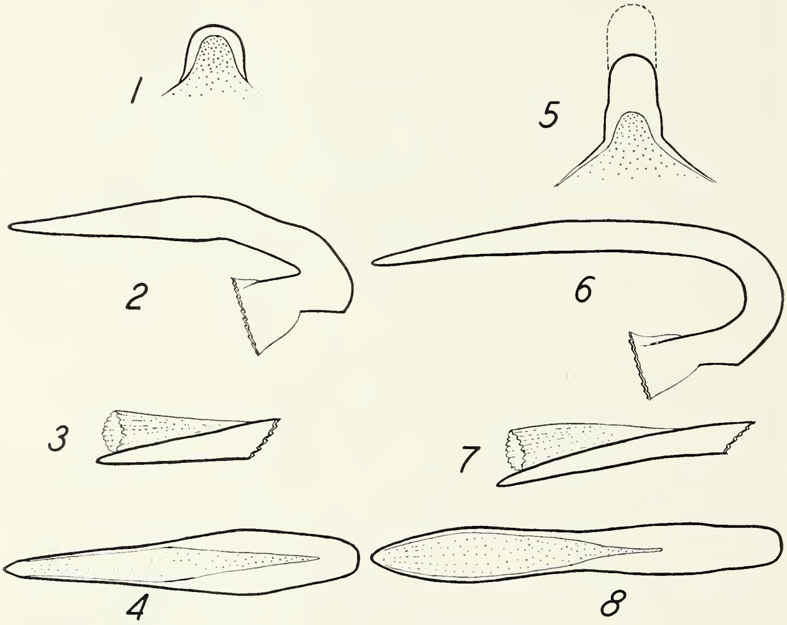
Both specimens are from "Newfoundland." Another label on each pin is not easily read: Ricker has suggested that it is either "Weston" or "Chuston." The "Chuston" possibility seems much the more likely since it would be very difficult to interpret the first letter of the label on the female specimen as a W; and furthermore, on the male the label seems quite clearly to start with a Ch. However, I am not able to find Chuston on any maps of Newfoundland available to me.

In spite of the condition of the types, I had no difficulty with the generic placement of these specimens. One of the best features for distinguishing *Capnia* from *Paracapnia* is the presence or absence respectively of a sharp curvature in the base of vein 1A of the front wing: this is visible in both specimens.

Lectotype.—Since the females of the two species of *Paracapnia* are presently indistinguishable, the male cotype of *P. opis* is here designated lectotype. It remains, of course, in the Hope Collection at Oxford.

Male.—Since the two known species of *Paracapnia* are presently distinguishable only by the structure of the supraanal process of the male, the poor condition of the lectotype presented a problem. The longer I tried to reconstruct in my mind the distorted pieces of the supraanal process the more nearly convinced I became that *opis* was the species with the longer more curved supraanal process (Fig. 6). The problem was satisfactorily resolved, however, only when I discovered a feature which I had missed when originally distinguishing the two species (Hanson, 1946). The ventral basal part of the supraanal process of the lectotype, which is not damaged, is clearly visible on the slide, and a comparison of several specimens shows a consistent difference between the two species in this region ventrally (Figs. 1 and 5). In *P. opis* the supraanal process extends much more posteriorly beyond the subanal lobes than in *P. angulata.* The narrowness of the base of the supraanal process of *opis* accentuates this appearance of greater length. Also, the membranous intrusion into the base of the supraanal process ventrally is narrower in *opis,* with much more of the supraanal process visible beyond the tip of the intrusion than is the case in *angulata.*

Further descriptive information on the male and a description of the female is contained in the original description of *P. curvata* (Hanson, 1946, pp. 236–8).



Figs. 1–4, *Paracapnia angulata,* n. sp., supraanal process. Fig. 1, Ventral view. Fig. 2, Lateral view. Fig. 3, Lateral view with seminal duct expanded and open. Fig. 4, Dorsal view. Figs. 5–8, *Paracapnia opis* (Newman), supraanal process. Fig. 5, Ventral view, with broken line indicating maximum posterior extension found in any specimen. Fig. 6, Lateral view. Fig. 7, Lateral view, with seminal duct expanded and open. Fig. 8, Dorsal view.

Paracapnia angulata, n. sp.

Capnia vernalis, Needham and Claassen, 1925, The Plecoptera or stoneflies of America North of Mexico, pp. 356–7, 2 questionable figs. of ♂♀ (in part?; not Newport, 1848).

Capnia opis, Ricker, 1938, Trans. Roy. Canad. Inst., vol. 22, pt. 1, no. 47, pp. 134–5 (in part?; not Newman, 1839).

Capnia opis, Frison, 1942, Bul. Illinois Nat. Hist. Survey 22(2): 264–5, figs. of ♂♀ good (collection data in part; not Newman, 1839).

Male.—A general description of this species would be superfluous because is is distinguishable from *P. opis* only by the supraanal process of the male. Figures 1–8 show ventral, lateral, and dorsal views of this process in comparison with the same of *P. opis.* Differences in the ventral view have been noted in the discussion of the lectotype of *P. opis.* In a lateral view of *P. angulata* both the inner and outer margins are angled at the base (Fig. 2). The inner margin may be as acutely angled as shown in the drawing or may approach a right angle, but it is never evenly curved as in *P. opis.* The supraanal process of *P. angulata* is shorter than that of *P. opis* and is also the thicker in either lateral or dorsal view. *P. angulata* has a single, usually conspicuous, bulge in both lateral and dorsal views, whereas *P. opis* is nearly uniform in width in lateral view and shows two slight enlargements in dorsal view. The appearance of the apical part of the supraanal process depends somewhat on the seminal duct which may be found in various stages of expansion in different specimens.

Most of the *P. angulata* males that I have studied are somewhat brachypterous, whereas in *P. opis* I have found no brachypterous males. Ricker, however, reported the wings of the lectotype of *opis,* which are now lost, to be brachypterous. Thus, though brachyptery may be more common in *P. angulata,* it is present in *P. opis* on occasion.

Female.—Although the two species of *Paracapnia* are sympatric, they have not been taken together at one stream. Therefore, even though the females of the two species are indistinguishable, it seems advisable to designate specimens taken in association with identifiable males as types.

Types.—*Holotype* male, *allotype* female, Pelham, Mass., 23 Mar. 1938 (J. F. Hanson). *Paratopotypes,* 18♂♂ 11♀♀. *Paratypes,* all from Massachusetts: 2♂♂, Sunderland, 30 Mar. 1937 (J. F. Hanson); 1♂, Paradise Trail, Sunderland, 19 Mar. 1938 (JFH); 2♂♂, Ware, 23 Mar. 1938 (JFH); Westbrook, 1♂ on 18 Feb. 1937, 1♂ on 29 Mar. 1937, 3♂♂ on 4 Apr. 1937, 2♂♂ 1♀ on 14 Apr. 1937, 1♂ 1♀ on 9 Feb. 1938 (JFH); 4♂♂ 1♀, Belchertown, 23 Mar. 1938 (JFH); E. Amherst, 1♂ on 6 Apr. 1937, 1♂ on 24 Apr. 1938 (JFH); Medford, 2♂♂ 1♀ on 29 Mar. 1937 (L. M. Bartlett), 3♂♂ 34♀♀ on 1 Apr. 1938 (LMB).

KEY TO MALES OF PARACAPNIA

Supraanal process of male angulate at base, 0.40 to 0.50 mm. long. *P. angulata*

Supraanal process not angulate but curved at base, thinner than that of the above species, 0.55 to 0.60 mm. long. . . . . *P. opis*

ACKNOWLEDGEMENTS

I am indebted to the staff of the Pitt Rivers Museum at Oxford for making available facilities and equipment for the study of the type of *Paracapnia opis* and to Dr. Edward Coher for critically reading and correcting the manuscript of this article.

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A MODIFICATION OF THE NEW JERSEY INSECT LIGHT TRAP TO REDUCE DAMAGE TO SPECIMENS.

By George F. Edmunds, Jr.[1]

Insects collected in light traps frequently are poor museum specimens. The larger moths usually beat their wings until they are tattered and the scales are rubbed off, and these scales then are scattered over the bodies of other insects in the collection. Most attempts to remedy this problem have been directed toward increasing the killing effectiveness of the container into which the insects fall or are blown by a fan.

I have operated fan-type standard New Jersey light traps for several years with considerable success in yielding specimens in good condition. My solution to the problem of preventing damaging struggling movements, rather than to effect a more rapid kill, is to keep the insects in the trap alive and give them a resting place.

The usual killing-jar is replaced with a large cloth sack about two thirds full of lightly packed crumpled newspaper. A regular 50-pound flour sack is ideal. Most insects which are blown into the bag crawl into crevices in the paper, presumably to avoid the draft from the fan. Trap yields in the area where the trap was operative were such that they would seldom exceed two inches in a pint jar, so it is possible that in areas with high yield, one might need a proportionately larger bag.

The trap is emptied in the morning by dropping the detached cloth bag into a large pliofilm bag and adding a chloroform or ether soaked wad of cotton. The cloth bag is emptied later onto a white paper, the crumpled paper gently shaken and unfolded and the dead insects sorted and processed for the collection. The small fragile insects as well as the larger moths are usually in good condition and are fresh and soft for pinning, rather than being dried out by the fan as insects dead for several hours would be.

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TAXONOMIC NOTES ON SOME MEXICAN AND CENTRAL AMERICAN ELAPHIDIONINE CERAMBYCIDAE (COLEOPTERA)

By E. Gorton Linsley[1]

During the past seventy-five years, the Elaphidionini of the United States and Canada have become much better known than they were at the time when the Mexican and Central American species were last reviewed (Bates, 1880, 1885). In addition, considerable progress has been made in attempting to understand their generic relationships. This paper is intended to present the result of a review of the described Mexican and Central American species in the light of these developments and to present a revised classification of the genera now known to occur in the region. No attempt has been made to include the West Indian fauna nor to integrate undescribed species, although these have been taken into account where feasible, in testing the validity of concepts.

Key to the Mexican and Central American Genera of Elaphidionini

1. Prosternum with intercoxal process arched, arcuately declivous posteriorly 2

Prosternum with intercoxal process nearly plane, truncate or rounded behind, abruptly and vertically or concavely declivous; antennal spines usually very long, some of the segments usually bispinose, spine of third segment nearly always much longer than second segment .... *Elaphidion*

2(1). Elytral apices each prominently bispinose, the outer spine usually longer, or truncate and unispinose with the spine long, external; or, some of the outer antennal segments bispinose 3

Elytral apices without apical spines or unispinose with the spine short, sutural; antennal segments unispinose or unarmed 4

3(2). Antennal spines moderate, usually gradually decreasing in length from third segment; episterna of metathorax always narrow and parallel-sided, or nearly so; size small to moderate .... *Elaphidionoides*

Antennal spines prominent, often long, some of the segments usually bispinose; episterna of metathorax often broad in front and distinctly narrowed behind; form large, robust . . . . *Enaphalodes*

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[1] University of California, Berkeley.

4(2). Metathorax with episterna narrow and parallel-sided, or nearly so 5

Metathorax with episterna broad in front, distinctly narrowed behind; form large, robust . . . . *Eustromula*

5(4). Pronotum with a median polished vitta, or antennae with spines on the third to seventh or eighth segments 6

Pronotum without a median polished vitta, or antennae, at most, with spines on the third to fifth or sixth segments 7

6(5). Labial palpi slender, maxillary palpi expanded, securiform; antennae with third to fifth segments spinose, sixth spiculate . . . . *Poecilomallus*

Labial and maxillary palpi similar or the latter only slightly expanded; antennal spines various . . . . *Anelaphus*

7(5). Antennae and legs bristling with long flying hairs; elytra without pubescent fasciae; antennae with spine of third segment prominent . . . . *Anopliomorpha*

Antennae and legs without long flying hairs; elytra with or without pubescent fasciae; antennae with spine of third segment usually short or lacking . . . . *Peranoplium*

Genus *Elaphidion* Serville

Elaphidion Serville, 1834, Ann. Soc. Ent. France 3:66; Lacordaire, 1869, Genera Coléoptères 8:300; Bates, 1880, Biologia Centrali-Americana, Coleoptera 5:24.

This generic name is used in the restricted sense for species in which the opposing faces of the pro- and mesosternum are vertical or concave. The antennal spines are usually very long and the posterior femora are usually but not always spined. In addition to *Elaphidion irroratum* (Linnaeus) and *E. mimeticum* Schaeffer, the following species should apparently be assigned here.

Elaphidion laeve White

Elaphidion laeve White, 1853, Catal. Coleopt. British Mus. 7:102.
Hypermallus laevis, Bates, 1880, Biologia Centrali-Americana, Coleoptera 5:26.

This species has the form and facies of *Elaphidion* and the prosternum is truncate behind, the mesosternum truncate and subvertical in front, the antennal spines are heavy on the third, fourth, and fifth segments, and the fifth to ninth or tenth segments are bispinose, a combination of characters that would exclude it from

Elaphidionoides (*Hypermallus* Bates). The type, a female, has the antennae about as long as the body, perhaps a little longer, with the eleventh segment not longer than the tenth. The femora are unarmed and the elytral apices are bispinose with the outer spine longer. The integument is dark reddish-brown and subglabrous, but apparently the specimen is badly rubbed or denuded, since a few hairs are evident near the elytral apices. The length is 14 mm.

Elaphidion scabricolle (Bates)

Hypermallus scabricollis Bates, 1872, Trans. Ent. Soc. London, 1872:175.

The generic characters of this species are anomalous, but the truncate pro- and mesosternal processes would appear to exclude it from *Elaphidionoides,* which it suggests in facies because of the cylindrical pronotum which is much narrower than the elytra, the pubescent pattern which consists of small tawny patches on the head, pronotum and base of elytra and small white flecks over the remainder of the elytra, the moderate antennal spines which are present only on segments three to six, none being bispinose, the unarmed femora, and the bidentate elytral apices in which the outer angle, at best, is subspiniform.

The type is a female from Chontales, Nicaragua. The integument is reddish-brown, shining, the pronotum coarsely alveolately and subconfluently punctate except for a median longitudinal smooth vitta; the elytra are coarsely, closely punctate at base, the punctures becoming finer beyond middle and disappearing before apex. The antennae (♀) reach to about the apical one-fourth of the elytra, the eleventh segment being but little longer than the tenth.

Elaphidion glabriusculum (Bates)

Hypermallus glabriusculus Bates, 1885, Biologia Centrali-Americana, Coleoptera 5:251.

Like the preceding, this species exhibits anomalous generic characters and might be assigned either to *Elaphidion* or *Elaphidionoides,* depending upon how much weight is given to the truncate, vertical or concave, intercoxal processes of the pro- and mesosterna, and the more prominent spine of the third antennal segment, which is much longer than that of the fourth segment. On these grounds, I have placed it in *Elaphidion.*

In coloration, the integument is reddish-brown, with a few obscure flecks of yellow or tawny pubescence on the pronotum and a few white flecks on elytra. The antennae are slightly longer than the body in the male with the eleventh segment distinctly longer than the tenth, attaining apical one-fifth of elytra in the female, the eleventh segment scarcely longer than the tenth. The pronotum is coarsely but not alveolately punctate, with a smooth median vitta. The elytra are coarsely, densely punctate at base, the punctures becoming finer and sparser beyond middle, and disappearing or evanescent toward apex, the pubescence is coarse, short, subdepressed, not obscuring the surface except for the widely scattered flecks of appressed white tomentum, and the apices are truncate with the inner angle subacute, the outer angle spiniform. The femora are unarmed. The length varies from 10–13 mm. in the type series from Bugaba, Panama, 800–1500 ft. elevation (Champion).

Genus *Elaphidionoides* Linsley

Elaphidionoides Linsley, 1957, Canadian Ent. 89:283.

Hypermallus, Bates (not Lacordaire, 1869), 1879, Biologia Centrali-Americana, Coleoptera 5:25; Casey, 1912, Mem. Coleoptera 3:292.

This genus is very similar to *Elaphidion* but differs by having the intercoxal process of the prosternum arched and arcuately declivous behind.

Elaphidionoides gibbulus (Bates)

Hypermallus gibbulus Bates, 1880, Biologia Centrali-Americana, Coleoptera 5:25.

Elaphidion arizonense Casey, 1892, Ann. New York Acad. Sci. 6:28.

Hypermallus arizonensis, Casey, 1912, Memoirs Coleoptera 3:299. (*New Synonymy*)

In this species the elytral apices are always emarginate but the development of the sutural and external spines varies considerably. In some cases the apices are prominently bispinose, in other cases little more than bidentate and frequently the external angle is scarcely more than truncate. Such individuals may run with difficulty to *Elaphidionoides* in the above key but nevertheless the species appears to be best assigned to that genus.

Elaphidionoides lanuginosus (Bates)

Hypermallus lanuginosus Bates, 1885, Biologia Centrali-Americana, Coleoptera 5:250.

Small, cylindrical, rufo-testaceous, irregularly clothed with rather long, appressed, dirty yellowish pubescence. Antennae about as long as body in the male, nearly attaining elytral apices in the female, spine of third segment much longer than that of fourth, fifth segment minutely spiculate. Pronotum cylindrical, about as long as broad, disk with a median longitudinal smooth area, broad and extending from base to apex in female, short and more or less limited to area behind mildle in male. Elytra coarsely punctate, basal punctures mostly separated by one diameter or less; apices truncate with a stout external spine. Femora unarmed.

This species differs from other *Elaphidionoides* in the greater proportional development of the spine at the apex of the third antennal segment.

Genus *Enaphalodes* Haldeman

Enaphalodes Haldeman, 1847, Proc. Acad. Nat. Sci. Philadelphia 3:151; Linsley, 1957, Canadian Ent. 89:283.
Romaleum White, 1855, Catal. Coleoptera Brit. Mus. 8:309; Bates, 1880, Biologia Centrali-Americana, Coleoptera 5:23.
Hypermallus Lacordaire, 1869, Genera Coléoptères 8:302.
Thersalus Pascoe, 1886, Jour. Ent. 2:372.

Enaphalodes is related to *Elaphidionoides,* but the included species are larger and more robust and usually have more prominent antennal spines, the prosternum wider in front, rather than subparallel, and in some species the two sexes exhibit pronounced differences in pronotal punctation and sculpturing. Several species are known to occur in Mexico or Central America, of which the following call for special mention.

Enaphalodes decipiens (Bates)

Hypermallus decipiens Bates, 1885, Biologia Centrali-Americana, Coleoptera 5:248.

This species is closely related to *E. atomarium* but apparently distinct. The type specimen, a male from Pasco del Macho, Mexico, is a little smaller (length 22 mm.) than the average male of *atomarium,* and has smaller, less acute antennal tubercles and antennae which exceed the elytral apices by only two segments.

Enaphalodes coronatum (White)

Elaphidion coronatum White, 1853, Catal. Coleoptera Brit. Mus. 7:100; Bates, 1880, Biologia Centrali-Americana, Coleoptera 5:24, pl. 3, fig. 12.

E. coronatum has somewhat anomalous generic characters but nevertheless the arcuately declivous prosternal process excludes it from *Elaphidion* as presently defined, and its robust form and well developed antennal spines suggest assignment of the species to *Enaphalodes* rather than *Elaphidionoides.* In coloration it is not unlike *Enaphalodes senex* (Bates) and *E. taeniatum* (LeConte). These last two were synonymized by Schaeffer (1908), and this synonymy is quite probably correct, although the type of the former differs slightly from Texan examples of *taeniatum* in the pattern of tawny flecks on the pronotum.

Genus *Poecilomallus* Bates

Poecilomallus Bates, 1892, Trans. Ent. Soc. London, 1892:151.

Integument shining with scattered long, coarse, erect hairs. Labial palpi slender, maxillary palpi greatly expanded, securiform. Antennae with apical spines on third to fifth segments, sixth segment spiculate, sparsely ciliate internally. Pronotum longer than broad, sides rounded, disk with a median polished callous and a pair of oval tubercles on each side; prosternum with intercoxal process arched, arcuately declivous posteriorly; intermediate coxal cavities closed externally; episterna of metathorax very narrow, attenuated anteriorly. Elytra with apices slightly emarginate, sutural angle feebly dentiform, outer angle narrowly rounded.

Poecilomallus palpalis Bates

Poecilomallus palpalis Bates, 1892, Trans. Ent. Soc. London, 1872: 151, pl. 5, fig. 6.

Head and thorax, basal half of elytra, and a transverse band before apex densely clothed with appressed pale pubescence. Pronotum minutely punctate and densely pubescent except for discal callouses. Elytra rather coarsely punctate near base where most of the punctures are separated by a diameter or less, the punctures becoming smaller at middle and disappearing toward apex, pubescence short, suberect, not dense, with an intermixture of very long erect hairs. Length 11 mm.

Type locality: Temax, N. Yucatan, Mexico.

Genus *Anelaphus* Linsley

Anelaphus Linsley, 1936, Ann. Soc. Amer. 29:464.

At least five species of *Anelaphus* have been recorded from Mexico previously. To these should be added the following Mexican or Central American species which were assigned to *Hypermallus* by Bates.

Anelaphus daedaleus (Bates)

Hypermallus daedalus Bates, 1874, Trans. Ent. Soc. London, 1874:219.

Chestnut-brown, the antennae and legs reddish-brown; pronotum with patches of yellowish tomentum on each side of disk, each elytron with a pair of oblique irregular streaks of ashy-yellow tomentum. Antennae a little longer than the body in the male with third to sixth segments spinose at apex, the seventh minutely spiculate, eleventh segment distinctly longer than tenth, nearly as long as body in female with the third to seventh spinose at apex, the eighth spiculate, eleventh segment not longer than tenth. Pronotum coarsely densely punctate, with a smooth median vitta over most of basal half of mid-line. Elytra coarsely and somewhat rugosely punctate at base, especially on disk, the punctures becoming a little smaller posteriorly; apices subtruncate, inner angle feebly dentiform. Length 12 mm.

Type locality: Chontales, Nicaragua. I have also examined a male from Los Cañas, Costa Rica.

Anelaphus jansoni, n. sp.

Male: Form moderately robust. Integument dark reddish-brown, clothed with short, depressed hairs and with condensed patches of appressed white pubescence. Head moderately finely, densely punctate behind upper lobes of eyes; antennae a little longer than the body, third to sixth segments spinose at apex, eleventh segment longer than tenth, more or less appendiculate. Pronotum wider than long, sides feebly rounded, disk with a narrow, longitudinal, median polished ridge extending from base to apex and slightly wider at middle, an oval, polished, coarsely punctate callous on each side in front of middle and a similar but more elongate callous behind the middle and closer to the sides, surface very finely densely punctate and thinly clothed with short, coarse, appressed pale hairs mostly oriented transversely, antero-laterally, or anteriorly, condensed into small patches at base and apex of median line, at base and apex of sublateral callous, and at middle of side; prosternum finely rugoso-punctate. Elytra coarsely punctate at base where the punctures are mostly separated by less than one diameter, becoming much finer beyond middle; surface uniformly clothed with short, depressed or recurved hairs, with irregular patches of appressed white pubescence, densest on humeri, along sides, at middle, and near apex; apices rounded to the suture. Abdomen finely, densely punctate, uniformly pubescent. Length 18 mm.

Female: Antennae reaching nearly to apical one-third of elytra, outer segments short, eleventh segment not longer than tenth; pronotum coarsely and somewhat confluently punctate on each side of polished median ridge; prosternum transversely rugose. Length 17 mm.

Holotype male, *allotype* female, and three male *paratypes* from Chontales, Nicaragua (Janson) in the collection of the British Museum (Natural History).

Notes: In size and form this species resembles *A. inermis* (Newman), with which it was confused by Bates. It differs at once, however, in the sculpturing of the pronotum which has a median polished ridge extending from base to apex in both sexes, and the form of the elytral apices which are rounded to the suture and not truncate.

Anelaphus panamensis, n. sp.

Male: Integument reddish-brown, clothed with short, depressed or recurved hairs, with condensed patches of longer, tawny, appressed pubescence. Head moderately finely, densely punctate behind upper lobes of eyes; antenna slightly longer than the body, segments three to six spinose at apex, eleventh segment longer than tenth, slender. Pronotum a little wider than long; sides very feebly rounded; disk with an elongate, longitudinal, median polished area which does not reach base or apex and an ill-defined, coarsely punctate longitudinal, arcuate callous on each side, intermediate area finely densely punctate; surface thinly clothed with moderately long, coarse, appressed, tawny hairs mostly oriented transversely, antero-laterally or anteriorly, condensed into patches at base and apex of median line, along arcuate sublateral callous and near sides; prosternum rugoso-punctate. Elytra coarsely and very densely punctate at base where the punctures are nearly contiguous, becoming smaller over apical one-third, surface irregularly clothed with condensed patches of moderately long appressed tawny pubescence; apices rounded to the suture. Abdoment shining, thinly clothed with long pale hairs. Length 14 mm.

Female: Antennae reaching to apical one-fourth of elytra, eleventh segment not longer than tenth; pronotum, coarsely, irregularly punctate on each side of mid-line, which is not so well defined as in the male, punctures mostly separated; prosternum coarsely punctate and transversely rugose. Length 13.5 mm.

Holotype male and *allotype* female from V. de Atitlan, Panama, elevation 25–3500 ft. (Champion, in the collection of the British Museum (Natural History). Other specimens from Bugaba and Mirandilla also appear assignable to this species but have not been designated paratypes.

Notes: This species is smaller than *A. inermis* and *A. jansoni* and the elytra are more densely punctate and the pubescence of the condensed patches is somewhat longer and tawny rather than ashy-gray. The median pronotal vitta is more elongate than in *inermis* but does not extend to the basal or apical margins, as in *jansoni*. The discal punctation of the pronotum is also distinctive, especially in the female.

Anelaphus subseriatus (Bates)

Hypermallus subseriatus Bates, 1885, Biologia Centrali-Americana, Coleoptera 5: 250.

This species is apparently related to the preceding, but differing in the arrangement of the elytral pubescence which is dirty yellow, irregular but moderately dense, with the coarse punctures showing through as in some *Hesperophanini*. The antennal segments are heavy and flattened, with spines at the apices of third to seventh segments, at least. Length 13–16 mm.

Type locality: San Lorenzo, Panama.

Genus *Peranoplium* Linsley

Peranoplium Linsley, 1957, Amer. Museum Novitates, 1828:17.

This genus is closely related to *Anopliomorpha* but differs in the absence of long flying hairs from the legs and antennae. The spine of the third antennal segment is usually short, sometimes lacking. In some of the species the elytra have pubescent fasciae.

KEY TO THE MEXICAN AND CENTRAL AMERICAN PERANOPLIUM

1. Pronotum and elytra with patches of dense white pubsecence 2

   Pronotum and elytra without patches of dense white pubescence, the pubescence irregular, appressed, griseo-fulvous, intermixed with longer suberect hairs; pronotum ovoid-cylindrical, disk with a post-median smooth callous; elytral apices subtruncate, slightly rounded externally, sutural angle dentiform. 11 mm. . . . . *misellum*

2. Pronotum subcylindrical, disk with a linear median smooth callous, pubescent spots large and well defined; antennae with segments three to six spinose at apex, seventh segment minutely spiculate; elytral apices emarginate, both angles distinct. 12 mm. . . . . *eximium*

   Pronotum with sides broadly rounded, disk without a smooth median callous, pubescent spots small, poorly defined; antennae with segments three to five spinose at apex, sixth segment minutely spiculate; elytral apices entire, not emarginate. 9–10 mm. .... *undulatum*

Peranoplium misellum (Bates)

Hypermallus misellus Bates, 1880, Biologia Centrali-Americana, Coleoptera 5:251.

Moderately small, subcylindrical, brown, appendages and elytra slightly more reddish-brown; pubescence appressed, griseo-fulvous, somewhat irregular, with an intermixture of longer erect and suberect hairs, which are not, however, as long as diameter of second antennal segment. Antennae of male as long as or a little longer than the body, third to fifth or sixth segments spinose at apex, the following segment spiculate, eleventh segment longer than tenth, that of female shorter than the body, segments three to six spinose at apex, seventh segment spiculate, eleventh segment not longer than tenth. Pronotum ovoid-cylindrical, disk with a short postmedian smooth callous. Elytra with apices subtruncate, sutural angle dentiform. Femora simple. Length 11 mm.

The type, a male, is from Guatemala. Examples have also been seen from Costa Rica and Panama.

Peranoplium eximium (Bates)

Hypermallus eximius Bates, 1885, Biologia Centrali-Americana, Coleoptera 5:250.

Brown, elytra and abdomen reddish-brown, antennae and legs rufotestaceous; pronotum with a pair of dense patches of white pubescence on each side of disk, a sublateral patch at base and a lateral patch at middle; elytra with a broken sinuous transverse series of white patches at middle, another before apex; thoracic sterna white pubescent marginally. Antennae slender, a little longer than the body, third to sixth segments spinose at apex, seventh spiculate. Pronotum subcylindrical, more or less alveolate-punctate, with a smooth median vitta. Elytra feebly emarginate-truncate at apex, angles distinct but not dentiform. Length 12 mm.

The type is from Oaxaca, Mexico.

Peranoplium undulatum (Bates)

Hypermallus undulatus Bates, 1880, Biologia Centrali-Americana, Coleoptera 5:25.

Dark brown, elytra, abdomen, and appendages dark reddish-brown; pronotum with two or three poorly defined patches of white pubescence on each side of disk, another near lateral margin; elytra each with a sinuous transverse patch of white pubescence at middle and an oval spot before apex; anterior coxae, mesosternum, and metasternum at sides, white pubescent. Antennae shorter than the body in both sexes, but longer in the male than in the female with the eleventh segment distinctly longer than the tenth and more or less appendiculate, segments three to five spinose, sixth segment spiculate. Pronotum broadly rounded at sides, disk alveolate punctate without a smooth median vitta. Elytral apices entire, not emarginate or dentate. Length, ♂: 12–14 mm., ♀: 9–10 mm.

The type locality is Trapiche, Mexico.

Genus *Anopliomorpha* Linsley

Two species of this genus have been recorded from northern Mexico, *A. reticolle* (Bates) and *A. rinconium* (Casey).

ACKNOWLEDGMENTS

This study is one of a number made possible by the National Science Foundation during the author's tenure as Research Professor, Miller Institute, University of California. Types of described species were kindly made available at the American Museum of Natural History, New York, by J. G. Rozen, at the British Museum (Natural History), London, by E. B. Britton, at the Museum of Comparative Zoology, Harvard University, by P. J. Darlington, at the Museum National d'Histoire Naturelles, Paris, by A. Villiers, at the United States National Museum, Washington, D.C., by J. F. G. Clarke and G. Vogt, and at the Universitets Zoologiske Museum, Copenhagen, by S. L. Tuxen.

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THE DESIGNATION AND DESCRIPTION OF THE NEOTYPE OF *TIPULA FRATERNA* LOEW (TIPULIDAE: DIPTERA).

By Dennis Hynes[1]

During the course of a taxonomic study of the "*fraterna*" complex, it became necessary to designate a neotype for *Tipula fraterna* Loew. The type of this species was described by Loew in 1864, and the type material has since been reported as lost (Alexander, 1915). Dr. Alexander (personal communication) informed me that the late Dr. Nathan Banks had examined the type material of certain species described by Loew (1864) in an attempt to find the types of *T. fraterna* and others which have also been lost. A letter was sent to the Harvard Museum of Comparative Zoology, where this material is located, asking if Dr. Banks had been successful in locating the insects, particularly *T. fraterna*. Dr. W. C. Brown (personal communication) informed me that he was "unable to find any material among the Tipulidae that is in any way marked as related to *T. fraterna* or that one might reasonably take as type material of that species." Since Dr. Alexander and Dr. Banks had examined this material and could find no type which referred to *T. fraterna,* I had to assume that the type of this species was indeed lost.

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In selecting the specimen to serve as the neotype, I used my conception of the species and tried to follow as closely as possible that which, in my opinion, Loew had in mind.

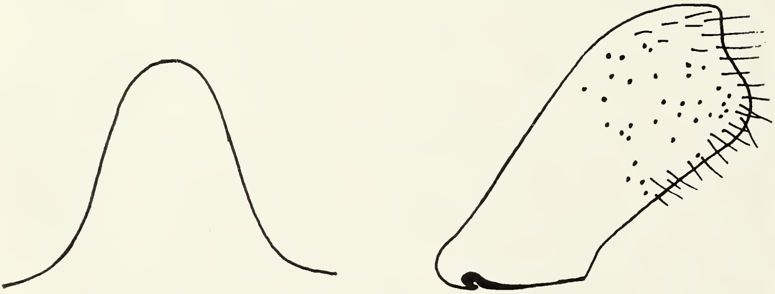
Due to the lack of specimens of *T. fraterna* from the type locality at Washington, D. C., a specimen was chosen from among a lot taken in Macon County, North Carolina. This was the region closest to the type locality from which specimens were available to me.

A description of the neotype specimen follows.

Measurements: Wing length, 16.50 mm.; body length, 15.80 mm.

Head: Frontal prolongation of head obscure yellow, nasus long, slender, dorsal surface sparsely pruinose; palpi brown. Antennae, if bent backward, extending slightly beyond base of abdomen; basal segment dark yellowish-brown, second segment concolorous, both segments sparsely pruinose; the first flagellar segment yellow with base vaguely darker. Remainder of flagellar segments bicolorous, nearly black at base with distal portion of each segment yellow, bicolorous condition becoming obscure at distal flagellar segments, gradually becoming more infuscated and darker. Head dark gray pruinose, vertex lighter; head with dark median vitta extending from vertex to occiput.

Thorax: Pronotum brown, mesonotal praescutum brownish-gray with three brown stripes, all indistinctly bordered with darker brown; the median stripe with a dark brown median vitta which becomes obscure before the suture; scutum brownish-gray prui-



Neotype of *T. fraterna.* Left: lobe of ninth tergite. Right: outer dististyle.

nose; scutellum paler yellowish-brown pruinose. Pleura light gray pruinose, slightly darker at propleura, sternopleurite, anterior anepisternum, and episternum. Halteres pale brown with knobs darker. Legs with coxae yellow, faintly black at posterior base; femora brownish-yellow, darkening slightly at distal tips; tibiae darker brownish-yellow; remainder of leg segments becoming darker with terminal segments of tarsi brownish-black. The entire apex of the wing dark brown; the inner end of the stigma yellow, the distal end dark brown; cell M paler; a narrow but conspicuous whitish band transversing wing at or a little before the cord, extending from the stigmal area into cells M_3 and M_4 and the inner end of cell 1st M_2. Veins dark brown except in area of the whitish band. Basal section of vein R_2 about one-half the length of cell 1st M_2, the latter relatively long and narrow; petiole of cell M_1 about one-third the length of cell M_1.

Abdomen: Abdominal tergites pale yellowish brown with broad dark brown sublateral stripes, lateral margins paler; the sublateral stripes vague at the second abdominal segment, darker in first and other segments. Sternites pale yellow-brown anteriorly, becoming dark brown at terminal segments. Hypopygium with caudal margin of ninth tergite bearing a conspicuous, strongly depressed and slightly triangular median lobe, the tip of the lobe bluntly rounded, the sides narrowing to an angle of thirty-nine degrees. The outer dististyle compressed, with vague apico-cephalic and apico-caudal lobes; setae slightly tufted in appearance at apico-caudal edge (see fig.). Ninth sternite with a deep V-shaped notch, the margins fringed with conspicuous elongate setae.

Neotype: Male; Macon County, North Carolina, at Highlands, altitude 3,800 feet, June 11, 1934 (J. S. Rogers, coll. no. 50) (slide no. 684, Hynes). The neotype will be retained in the University of Florida Insect Collection, Gainesville, Florida.

Topotypes: Five males; Macon County, North Carolina, at Highlands, June 11, 1934 (J. S. Rogers, coll. no. 50) (slide no. 6660, J. S. R.). Six males; Macon County, North Carolina, at Highlands, 3,800 feet, June 12, 1934 (J. S. Rogers, coll. no. 58) (slide nos. 6658, 6659, J. S. R.). Topotypes will be deposited in the University of Florida Insect Collection.

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OBSERVATIONS ON THE IMMATURE STAGES OF *PROTODICTYA HONDURANA* (DIPTERA: SCIOMYZIDAE)[1]

By S. E. Neff[2] and C. O. Berg[3]

Although the reference literature is confused concerning the food habits of sciomyzid larvae (cf. Sack, 1938; Bertrand, 1954; and others), studies initiated several years ago by Berg seem to warrant the conclusion that larvae of this family feed exclusively on the soft parts of gastropod mollusks. Berg (1953) reported the feeding activities of larvae of six species and suggested that the family may be "integrated biologically by the common food preferences of their larvae." Subsequent investigations have not only supported this hypothesis, but have disclosed interesting differences in the associations of various larvae with their snail prey.

Larvae belonging to the genera *Sepedon* and *Dictya* characterize the aquatic, predatory Tetanocerinae, which kill their prey quickly, operate with efficiency in water as well as on land, and commonly kill more than a dozen snails during the growth of each larva (Berg, *et al.,* 1955). At the other extreme, terrestrial, parasitoid larvae of some Sciomyzinae may feed on a snail for 7 or 8 days before killing it and confine all of their feeding to the one snail (Foote, 1959). Other species have intermediate and less fixed habits. The larvae of *Atrichomelina pubera,* for instance, resort to predatory, parasitoid, or even saprophagous feeding, depending on the food available and on the intensity of intraspecific competition (Foote, *et al.,* 1960).

Most of the publications on Sciomyzidae that present detailed biological notes and diagnostic figures and descriptions of immature stages concern species of Sciomyzinae. *Protodictya hondurana* Steyskal is a member of the Tetanocerinae, and the immature stages obtained in laboratory rearings present morphological and behavioral differences from those of the Sciomyzinae. Since both the larvae and the puparia of this species have evident aquatic adaptations, it might be expected to display larval feeding habits

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essentially the same as those of *Dictya* and *Sepedon*. However, *P. hondurana* differs from these typical aquatic predators in this and in other respects.

The genus *Protodictya* was erected by Malloch (1933) and was based upon specimens from several localities in Chile. It can be distinguished from other members of the Tetanocerinae by the combination of a white, densely pubescent arista, a triangular third antennal segment, and a black spot in the middle of the face, as in *Dictya*. Steyskal (1950) enumerated 6 species referable to this Neotropical genus from Mexico and from Central and South America. He described *P. hondurana* in this paper, based upon three specimens collected at Pt. Cortes, Honduras; St. Engracia, Tamaulipas, Mexico; and Granada, Nicaragua. These three locality records appear to be the only ones published for this species, but two more are added in the present paper.

With their long, porrect antennae and frog-like posture, *Protodictya* adults bear so much resemblance to those of *Sepedon* that two species now included in the genus were originally described in *Sepedon* (Schiner, 1868, van der Wulp, 1897). However, all species of *Protodictya* differ from *Sepedon* in bearing the prominent, median, black spot on the face, four scutellar bristles, and dark, metallic spots at the bases of the thoracic hairs.

Laboratory rearings of *P. hondurana* were initiated with feral adults collected 2.1 kilometers east of Barberena, Santa Rosa, Guatemala (elevation 1341 meters), and 9.2 kilometers east of San Lorenzo, Valle, Honduras (elevation 60 meters). These collections were made on July 22 and July 30, 1958, respectively. Both of the collection sites were open, wet meadows that were in use as pasture. Adults were captured by sweeping the various grasses and sedges in the moist depressions of these areas. They were transported to the laboratory at Ithaca, New York, for observation and rearing of the immature stages.

Eight-ounce, wide-mouth, glass jars in which the flies were confined for mating and oviposition were prepared in advance to supply certain physiological requirements. The bottom of each jar was covered with a layer of living moss about one-half inch deep. Moistened every day, this moss provided water for drinking and maintained high humidities comparable with those in natural habitats. One or two sections of *Typha* leaf standing almost vertically on the moss provided natural resting surfaces and sites for oviposition. A small pellet of food, a mixture of brewers' yeast and honey with a pinch of calcium proprionate added to inhibit mold, was pressed against the inside shoulder of each jar. (No attempt was made to provide a carefully balanced, chemically defined diet, and the proportions used were determined solely by the criterion of proper consistency. It had to be sticky enough to adhere to the glass, yet dry enough to remain in place for days without liquefying and running down into the moss.) Two or three living snails of different species were placed on the moss, because the presence of snails may stimulate ovipostion. After the flies were admitted, each jar was covered by a piece of double-thickness cheesecloth, secured in place by one or two rubber bands.

Adults maintained in these breeding jars mated readily, assuming mating postures similar to those of certain other species of Sciomyzidae. The male stood over the female and grasped her antennae with his fore tarsal claws. His middle legs were extended laterally. His body, and his flexed hind legs resting on the female's abdomen, held her wings spread.

Female flies laid numerous eggs on the sides of jars and on the *Typha* leaves. They were usually arranged in vertical rows, lying end to end rather than side by side as in most species of *Dictya* and *Sepedon*. The eggs were transferred to one-ounce, widemouth, stoppered, glass jars, supplied with a layer of moist sand ⅛ to ¼ inch deep, for hatching and rearing of the larvae. With the laboratory temperature varying between 20 and 28 degrees Centigrade, hatching occurred in 3½ to 5 days.

The newly hatched larvae attacked and killed small individuals (2–6 mm. in diameter) of *Helisoma trivolvis* (Say) and *Biomphalaria* (= *Australorbis*) *glabratus* (Say). Their attacks were swift, and the snails bled profusely soon after the larvae entered their shells. Except for the forthright, decisive attacks, however, their feeding behavior is very different from that of other aquatic tetanocerine larvae which resemble them morphologically. After feeding to repletion, larvae of *P. hondurana* remained within the shells of the snails they had killed until they again became hungry, when they fed again on the same snails. They seemed reluctant to leave the shells even when the snail tissues reached advanced stages of decay. In fact, they usually did not leave until all of the malodorous, liquefied material was consumed.

In their tendency to remain within snail shells even when not feeding, their tolerance of putrescent conditions, and their willingness to feed on decayed snails, these larvae differ from all other known tetanocerine larvae and especially from the aquatic species in closely related genera. The known larvae of *Sepedon* and *Dictya,* for instance, leave their victims as soon as their immediate hunger is satisfied, show considerably more inclination to kill new snails than to return to any that have been dead for several hours, and even die (in closed rearing jars) if the dead snails are not removed every day. The more parasitoid, terrestrial, first instar larvae of certain species of *Tetanocera* and *Hoplodictya* rest within shells of their hosts between feedings, but they feed in such a way that the snails remain alive until after the first larval molt. When the snails finally die, these larvae are somewhat tolerant of putrescent conditions, but not nearly as tolerant as *P. hondurana* larvae. Among the Sciomyzinae, where parasitoid feeding commonly changes to saprophagous feeding after death of the host snail, feeding behavior similar to that of *P. hondurana* is found especially in the larvae of *Atrichomelina pubera* (Foote, *et al.*, 1960).

Tolerance of putrescent food and the habit of remaining in shells that contain it may be primitive conditions, as was suggested concerning *A. pubera* (Berg, *et al.*, 1959). Alternatively, this way of life may result from secondary specializations, two possible advantages of which are apparent. A tolerance for putrescent food, enabling larvae of this species to utilize each snail more completely, would have survival value if the food supply ever is limited. If the breeding sites are often dried completely by sun and wind, the habit of remaining for days in the moisture within a snail shell may be instrumental in avoiding death from desiccation.

Laboratory observations made on these larvae suggest that their float hairs and other "aquatic" adaptations may not be used primarily to fit them for life in aquatic habitats at all. Although this clearly is the principal use of similar adaptations in larvae of *Sepedon, Dictya,* and most other tetanocerine genera, larvae of *P. hondurana* apparently use them primarily to avoid complete immersion and asphyxiation in decayed and liquefied snail tissues. In other dipterous families, many larvae that do not live in aquatic habitats have float hairs, and the explanation commonly accepted for this phenomenon is that they must remain afloat in the liquid substance that functions both as their food and as the medium in which they live.

If the first snails killed by newly hatched larvae were relatively large (7–10 mm. in diameter), the larvae usually remained in these shells until after their first molt. Some of the cast exuviae were found in the shells, and second instar larvae were observed continuing their feeding activity. Because many exuviae were immersed in liquefied snail flesh and could not be found, it was often difficult to determine the duration of larval stadia.

As with most cyclorrhaphous Diptera, three larval instars and three stadia were observed. Durations of larval stadia were ascertained in eight instances and were as follows: first, 2–5 days; second, 3–6 days; third, 9–13 days. Duration of the larval stadia seemed to be influenced by the size of snails offered the larvae. If a third instar larva was given a fairly large (10–14 mm. diameter) *H. trivolvis,* the larva obtained sufficient food to complete its development and matured directly and rapidly. But if the food snail was smaller, the larva presumably remained in the empty shell 4 or 5 days after consuming all edible material, apparently not feeding and developing more slowly. Multiple infestations in the rearing jars also apparently deprived larvae of sufficient food and prolonged their stadia.

Mature larvae left their snails and crawled about in the jar for twenty-four to thirty-six hours before burrowing into the sand and forming puparia. Pupation time in the laboratory was 10–12 days.

The time elapsed between emergence of five laboratory-reared female flies and appearance of their first eggs ranged from 6 to 14 days, averaging 9.2 days. Two females were observed mating 36–48 hours after they emerged.

The nutrition flies receive after reaching the adult stage apparently is very important in determining the number of eggs laid. Two females laid 141 and 151 eggs in the two weeks after their first eggs were laid. In the two weeks following, their egg laying declined to 57 and 43 eggs, respectively. Because the honey-yeast food mixture may not have been supplying all the nutrients neces-

Explanation of Plate

Fig. 1, Posterior spiracular disc, third instar larva; DL—dorsal lobe, DIL—dorsolateral lobe, FH—float hair, LL—lateral lobe, SS—spiracular slit, ST—stigmatic tube, StS—stigmatic scar, VL—ventral lobe, VlL—ventrolateral lobe. Fig. 2, Same, second instar larva. Fig. 3, Same, first instar larva. Fig. 4, Anterior spiracle, third instar larva. Fig. 5, Cephalopharyngeal skeleton, first instar larva. Fig. 6, Same, second instar larva. Fig. 7, Cephalopharyngeal skeleton, third instar larva; AT—accessory teeth, DC—dorsal cornua, ES—epistomal sclerite, HS—hypostomal sclerite, LS—ligulate sclerite, MH—mouthhook, PS—pharyngeal sclerite, SDA—salivary duct aperture, VA—ventral arch, VC—ventral cornua. Fig. 8, Puparium, dorsal view. Fig. 9, Accessory teeth, mouthhook of third instar larva. Fig. 10, Ventral arch, third instar larva, ventral view with anterior margin on left. Fig. 11, Puparium, lateral view. Fig. 12, Egg, dorsal view, micropylar end to the right.

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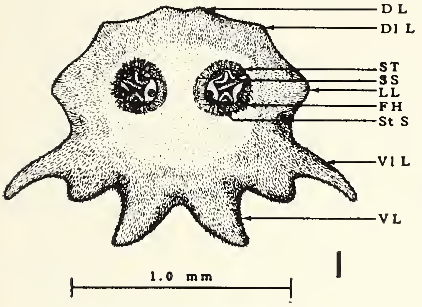
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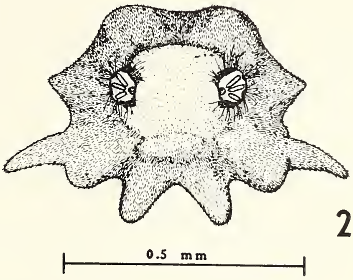

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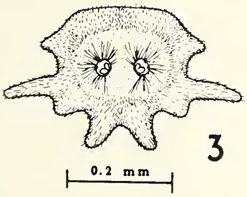

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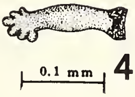

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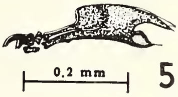

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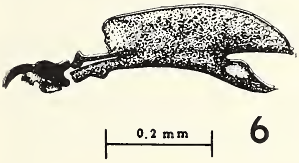

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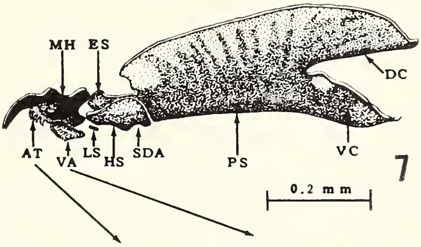
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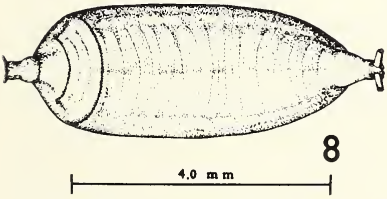

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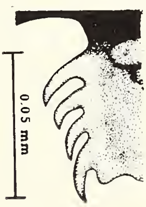

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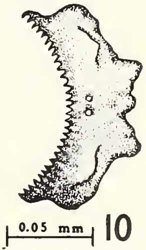

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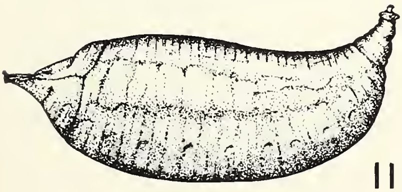

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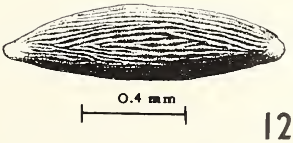

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sary for full egg production, crushed snails were added to the breeding jars as suggested by Chock (personal communication). During the following ten days, these flies laid 119 and 126 eggs, respectively.

The complete life cycle ranged from 33½ to 55 days in the laboratory. This suggests that under continuously favorable conditions *P. hondurana* could produce six to ten generations per year. A female fly oviposits over a long period of time (the period apparently being determined by adult nutrition), and one may still be laying viable eggs after her oldest daughters have started to oviposit. Thus the generations would be expected to spread in time and to overlap each other, becoming unrecognizable in nature.

First-generation adults lived from 32 to 177 days under laboratory conditions (32–177 for five females, 62–157 for eight males).

DESCRIPTION OF IMMATURE STAGES

Egg: (Fig. 12). White. Length 1.08–1.13 mm. ($\bar{x}$ = 1.10 mm.); width 0.30–0.36 mm. ($\bar{x}$ = 0.32 mm.). Twelve to sixteen low, longitudinal ridges visible dorsally; crest of each ridge undulating, giving ridge appearance of being interrupted; ridges anastomosing at each end of egg. Ventral and lateral surfaces with low, longitudinal ridges, as dorsal surface. Micropyle at wide, bluntly rounded end of egg, shielded dorsally by single, rounded tubercle covered by minute punctations. End opposite micropyle terminating in narrower, hemispherical to conical tubercle also bearing minute punctations. (Based on 13 specimens.)

First instar larva: White, integument transparent. Length 1.5–3.9 mm. ($\bar{x}$ = 2.4 mm.); width 0.2–0.7 mm. ($\bar{x}$ = 0.37 mm.). Resembling third instar larva in general body shape and distribution of hair patches and body tubercles. Sensory papillae and plates on segment 1 as in third instar. No anterior spiracles. Cephalopharyngeal skeleton (Fig. 5), length 0.26–0.33 mm. ($\bar{x}$ = 0.30 mm.); with paired mouthhooks, each mouthhook bifid anteriorly, articulating with ventral arch below and fused hypostomal-pharyngeal sclerite behind. Posterior spiracular disc (Fig. 3) with 3 pairs of prominent lobes; ventral pair only slightly longer than wide, rounded apically; ventro-lateral pair with broad basal portion, elongate apical portion more than twice as long as wide arising dorsally; lateral lobes evident as short, conical protuberances on each side. Two spiracular plates in middle of disc, each plate with B-shaped spiracular opening and 4 palmately-branched float hairs. Anal proleg a prominent transverse lobe on anterior margin of anal plate, bearing 4–5 rows of dark, decurved hooks on posterior surface. (Based on 14 specimens.)

Second instar larva: Light brown, integument transparent. Length 3.4–7.0 mm. ($\bar{x} = 4.7$ mm.); width 0.5–1.4 mm. ($\bar{x} = 0.8$ mm.). Resembling third instar larva in general appearance and distribution of sensory papillae and plates on segment 1, hair patches, and body tubercles. Cephalopharyngeal skeleton (Fig. 6), length 0.45–0.54 mm. ($\bar{x} = 0.49$ mm.); with paired mouthhooks, each bearing 3 or 4 decurved accessory teeth below hook; ventral margins of mouthhooks articulating with ventral arch below, posterior margin articulating with fused hypostomal-pharyngeal sclerite behind. Ventral arch with 22–26 teeth on anterior margin, posterior border emarginate (similar to Fig. 10). Ventral cornua of fused hypostomal-pharyngeal sclerite with hyaline area or "window." Anterior spiracles located posterolaterally on segment 2; each spiracle bearing 5–6 rudimentary papillae on apical portion. Posterior spiracular disc (Fig. 2) with 4 pairs of lobes on margin; ventral pair about as long as wide, rounded apically; ventrolateral pair with broad basal portion and lanceolate dorsal projection; lateral lobes conical, pointed apically; dorsal pair low, dome-like protuberances. Two spiracular plates, each bearing 3 elongate-oval slits and 4 palmately-branched float hairs. Anal proleg a prominent lobe on anterior margin of anal plate, bearing 4–5 rows of decurved, hyaline hooks on posterior surface. (Based on 10 specimens.)

Third instar larva: Light brown, integument transparent. Length 7.1–11.5 mm. ($\bar{x} = 9.5$ mm.); width 1.3–2.5 mm. ($\bar{x} = 1.8$ mm.). Segment 1 bilobed anteriorly, each lobe bearing two-segmented sensory papilla and circular sensory plate; labral papilla on each side of mouth opening; no labral rami on oral lobes; post-oral spine band posteroventrally, extending half-way up each side. Cephalopharyngeal skeleton (Fig. 7), length 0.65–0.81 mm. ($\bar{x} = 0.74$ mm.); with paired mouthhooks, each with 3 or 4 slightly decurved accessory teeth beneath hook portion (Fig. 9). Ventral arch (Fig. 10) articulating with ventral margins of mouthhooks, bearing 22–28 teeth on anterior margin; posterior border irregular, emarginate. Hypostomal sclerite (HS) articulating with posterior margins of mouthhooks, in ventral view, appearing as an inverted "A"; epistomal sclerite (ES) extending over it dorsally; ligulate sclerite (LS) lying below anterior rami. Pharyngeal sclerite (PS) with dorsally-radiating pigment lines; ventral cornua (VC) with small hyaline area of "window" basally on dorsal margin. Segment 2 bearing pair of anterior spiracles, each spiracle (Fig. 4) with 5–7 papillae distally; middle third of spiracle slightly inflated. Segments 5–10 each with 2 pairs of hair patches dorsally and dorsolaterally, each hair patch bearing 3–5 fine bristles; lateral tubercle group with 3 contiguous tubercles, middle one slightly anterior to upper and lower tubercle, each tubercle bearing 1 or 2 fine hairs; ventral transverse tubercle group of 4 tubercles, with 2 wide-set tubercles and transverse welt anterior to 4 tubercles, secondary integumentary folds prominent ventrally and laterally. Segment 11 without hair patches dorsally. Posterior spiracular disc (Fig. 1) with 2 pairs of prominent lobes; ventral pair (VL) conical, about one and one-half times as long as wide; ventrolateral pair (VlL) with broad basal portion and elongate finger-like process dorsally; lateral lobes (LL) blunt, conical protuberances; dorsolateral (DlL) and dorsal lobes (DL) low, inconspicuous protuberances. Two spiracular plates in central area of disc slightly elevated from disc surface on low stigmatic tubes (ST); each plate with three elongate slits (SS); middle slit straight; upper and lower slits angulate to arcuate. Four palmately-branched float hairs (FH) alternating with spiracular slits. Anal proleg a prominent rounded protuberance on anterior margin of anal plate, bearing 4–6 rows of decurved, hyaline hooks on its posterior surface. (Based on 13 specimens.)

Puparium: (Figs. 8, 11). Dark reddish brown, opaque. Length 4.8–6.3 mm. ($\bar{x}$ = 5.5 mm.); width 1.8–2.5 mm. ($\bar{x}$ = 2.2 mm.). Cylindrical, with ends tapering and posterior end upturned to form angle of 100–120° with longitudinal body axis. Cephalic caps projecting anteriorly; anterior spiracles conspicuous, thrust laterally at anterolateral border of dorsal cephalic cap. Hair patches not evident dorsally nor dorsolaterally; tubercle groups appearing as shagreen areas laterally and ventrally. Posterior end bearing spiracular plates apically on widely diverging stigmatic tubes. Lobes of spiracular disc shrunken, inconspicuous. Anal plate on posterior side of upturned portion; anal proleg retracted, inconspicuous. (Based on 15 specimens.)

Discussion: Protodictya hondurana larvae possess all the general features of larvae belonging to the *Tetanocerinae*, as outlined by Foote, *el al.* (1960). As with all sciomyzid larvae, *P. hondurana* has a ventral arch, an unpaired sclerite in close association with the ventral border of each mouthhook. The larvae of this species can be recognized by the emarginate condition of the posterior border of the ventral arch; the four, prominent, accessory teeth on each mouthhook; and, in the third instar, the angulate or arcuate condition of the upper and lower spiracular slits on each spiracular plate.

It should be emphasized that the second instar larva also has three slits on each posterior spiracular plate, but that in this instar the upper and lower slits are straight. The first point deserves particular attention because of wide acceptance of the generalization that the number of openings on each spiracular plate provides a quick, reliable way of identifying the larval instar in all cyclorrhaphous Diptera. Larvae of *Atrichomelina pubera* (Sciomyzinae) uphold this generalization, having one (more or less double) opening on each plate in first instar, two slits in second instar, and three in third instar (Foote, *et al.*, 1960). However, all tetanocerine larvae that we have studied have three slits on each plate in second instar as well as in third.

The puparium of *P. hondurana*, although probably occurring more commonly in the soil than in water, has the upturned posterior end and overall shape characteristic of the floating puparia of aquatic Tetanocerinae. It can be distinguished from all other known puparia in this group by the long, diverging stigmatic tubes resulting in widely spaced spiracular plates at their ends.

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A NEW *OPIUS* AND TWO NEW SPECIES OF *MICROCTONUS* (HYMENOPTERA: BRACONIDAE)

By C. F. W. Muesebeck[1]

Recently a new species of *Opius* and two new species of *Microctonus* were received for identification. The *Opius* had been reared from larvae of the walnut husk fly, and the two *Microctonus* from adults of two different weevils. Since names are desired for use in biological studies the three species are described here.

Opius juglandis, n. sp.

This form falls in the *ferrugineus* Gahan complex, which I discussed in 1956 (Ent. News 67: 99–102). From all three species treated there it differs in having the propodeum smooth and polished basally, in its relatively shorter second abscissa of radius, in the unusually weak occipital carina, and in the longer clypeus and correspondingly narrower opening between clypeus and mandibles. From *muliebris* Mues. it differs further in having a greater number of antennal segments and a longer ovipositor; from *ferrugineus* Gahan in its longer ovipositor, and from *alloeus* Mues. in having the dorsal keels of the first tergite very weak or indistinct on the apical third.

Female.—Length about 3.8 mm. Head about as broad as thorax; face twice as broad as long and with a few scattered punctures; clypeus flattened, its apical margin slightly, broadly rounded, not emarginate as in the other three species mentioned above; opening between clypeus and mandibles very narrow; malar space a little shorter than basal width of mandible; temples convex, not receding; antennae of the specimens examined 39- to 43-segmented.

Mesoscutum smooth and polished, with a median dimple-like

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[1] U. S. National Museum, Washington, D. C.

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impression before posterior margin and deep notauli anteriorly setting off a prominent median lobe. Propodeum weakly rugulose, and with a large, transverse, smooth and polished area at base each side of a very short median longitudinal keel. Mesopleuron smooth and with a broad longitudinal impression below that is weakly foveolate. Metapleuron largely smooth and shining but somewhat roughened posteriorly. Second abscissa of radius not longer than first intercubitus and not more than one-third as long as third abscissa of radius. Recurrent vein entering second cubital cell. Postnervellus distinct, straight, nearly parallel with nervellus.

Abdomen in widest part a little narrower than thorax. First tergite longer than broad on caudal margin, longitudinally striate, and the two dorsal keels well developed basally but becoming obsolescent beyond middle; remainder of abdomen smooth and shining, except occasionally the second tergite with a few weak and short striae medially at base. Ovipositor sheath fully as long as the body.

Honey yellow. Tips of mandibles and the stemmaticum black. Antenna blackish except for scape below. Fore and middle tibiae a little dusky; hind tibiae blackish except narrowly at their bases; fore and middle tarsi each with the apical segment black. Wings hyaline, stigma and veins dark.

Male.—In all significant respects like the female, except that in the only specimen I have seen in which they are complete the antennae are 47-segmented.

Type-locality.—Portal, Arizona.

Type.—U. S. National Museum No. 65523.

Described from 19 females (one, the holotype) and 1 male reared from *Rhagoletis juglandis* (Cress.) July 26, 1960, by S. E. Flanders. The National Museum has 14 additional specimens reared by Dr. Flanders from the same host, at the type locality, in 1959. These are not included in the type series, however, since they are not in very good condition.

Microctonus pachylobii, n. sp.

This is most similar to *M. vittatus* Mues., but it may be distinguished immediately by its unusually large eyes, longer radial cell and extraordinarily short female antennae.

Female.—Length about 2 mm. Head much broader than thorax. Eye very large, its transverse diameter greater than width of face and more than twice width of temple. Malar space less than half as long as basal width of mandible. Face smooth or only very weakly shagreened. Antenna about as long as head and thorax combined, 18-segmented in all specimens seen, first flagellar segment noticeably longer than second and a little narrowed basally, flagellar segments 9 to 15 at least as broad as long. Occipital carina complete or only very narrowly interrupted medially.

Notauli complete, foveolate. Middle lobe of mesoscutum with scattered, large though shallow, punctures. Mesopleuron smooth and shining medially, roughened above and below. Metapleuron completely and strongly rugose reticulate. Propodeum rugulose, its posterior face broadly and shallowly excavated. Radius arising from middle of stigma; radial cell on wing margin much more than half as long as stigma. Nervellus a little longer than lower abscissa of basella.

Abdomen a little narrower than thorax. First tergite about twice as long as broad on caudal margin, carinately margined at the sides both before and behind spiracles, which are at about the middle of the tergite. Postpetiole finely longitudinally aciculate; remainder of abdomen smooth. Ovipositor sheath about as long as hind tibia.

Honey yellow. Antennae dark beyond first flagellar segment. Stemmaticum black. Thorax sometimes with indefinite dusky shading. Wings hyaline, stigma and veins yellowish.

Male.—Like the female except for somewhat smaller eyes, and much longer antennae which are usually 24-segmented and have all the flagellar segments much longer than broad. Vertex, occiput and dorsum of thorax more or less piceous.

Type-locality.—Olla, Louisiana.

Types—U. S. Nat. Mus. No. 65524.

Described from 22 females (one type) and 8 males reared from adults of the weevil *Pachylobius picivorus* (Germar) May 20 to June 8, 1957, under Hopkins U. S. Nos. 36237 and 36245.

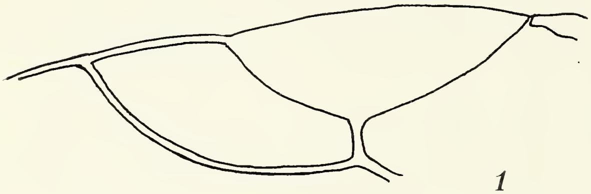
Microctonus invictus, n. sp.

This species runs to couplet 4 in my published key to the Nearctic species of this genus (1936, U. S. Dept. Agric. Misc. Pub. 241:15). It differs from *mellinus* (Prov.) in having the lateral lobes of the mesoscutum largely glabrous and the radial cell hardly half as long as the stigma; and from *eleodis* (Vier.) it is distinguished by its larger size, longer antennae, much larger eyes and narrower face and temples.

Female.—Length about 4 mm. Head wider than thorax; eye very large, wider than face and more than twice as wide as temple, which recedes strongly from eye. Malar space less than half as long as basal width of mandible. Face smooth and shining.

Ocellocular line less than twice diameter of an ocellus. Antennae as long as the body, very slender, 27-segmented in the two known females, all segments at least twice as long as thick. Occipital carina strong, very narrowly interrupted medially.

Thorax shining, sparsely hairy. Notauli well impressed, foveolate, meeting at posterior margin of mesoscutum; a triangular rugulose area before juction of notauli. Surface of mesoscutum



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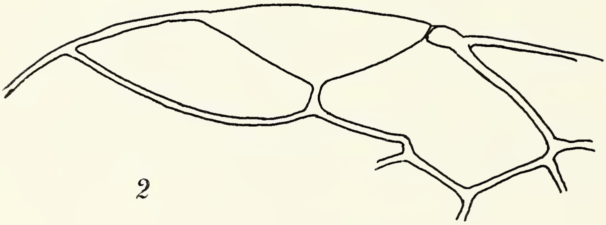

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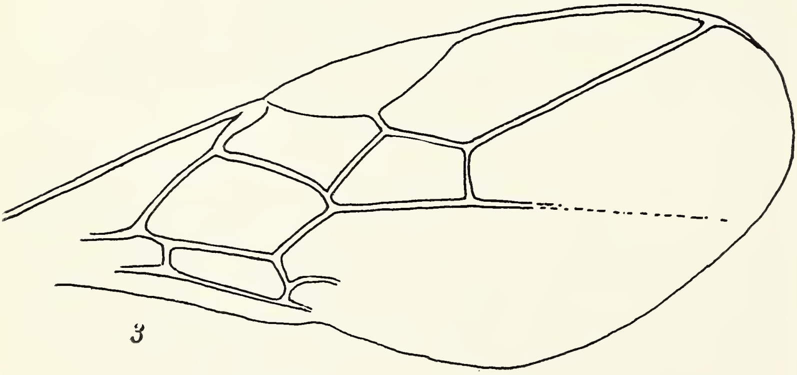

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Fig., 1, *Microctonus invictus,* n. sp., stigma and radial cell. Fig. 2, *Microctonus pachylobii,* n. sp., part of forewing. Fig. 3, *Opius juglandis,* n. sp., forewing.

not punctate, the lateral lobes largely glabrous. Side of prontoum finely rugulose except above where it is smooth and polished. Mesopleuron smooth, with a shallow impression below that is irregularly punctate rugulose. Propodeum rugose reticulate, its dorsal face strongly convex and its posterior face somewhat hollowed out medially. Metapleuron completely closely rugulose. Stigma large and emitting radius from slightly beyond its middle, fully twice as long as radial cell measured on wing margin. Nervellus much longer than lower abscissa of basella which is much shorter than upper abscissa. Hind tibia very long, longer than hind tarsus, its calcaria subequal and about one-fifth as long as metatarsus.

Abdomen not as wide as thorax. First tergite more than twice as long as wide on posterior margin. Spiracles a little behind the middle. Petiole slender and nearly smooth, postpetiole longitudinally striate; remainder of abdomen smooth and polished. Ovipositor sheath a little shorter than hind tibia.

Brownish yellow. Antennae brownish black except basally. Wings hyaline, stigma brown, veins paler.

Male.—Essentially as in the female. Antennae 33-segmented in the single known male with complete antennae. Mesopleural impression a well defined furrow that is coarsely foveate.

Type-locality.—13 miles N. E. Desert Center, Riverside Co., California.

Type.—U. S. Nat. Mus. No. 65525.

Described from two females (one type), from the type locality, and one male from Kelso, San Bernardino Co., California, all reared by E. R. Tinkham from adults of *Trigonoscuta* sp., the females on April 2, 1960, the male on April 30, 1960; and one male collected at Yuma, Arizona, on March 30, 1940, by L. S. Henderson.

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MISCELLANEOUS PREY RECORDS OF SOLITARY WASPS. IV.[1] (HYMENOPTERA: ACULEATA)

By Karl V. Krombein[2]

The present contribution records some miscellaneous prey records and other biological observations made on solitary predaceous wasps of the families Pompilidae and Sphecidae at Plummer's Island, Md., and Lost River State Park, W. Va., during 1959 and 1960. The wasps and their prey have been placed in the U. S. National Museum. I am indebted to H. E. Evans for identification of *Aporinellus completus* Bks. and to the following specialists for identification of the prey: A. B. Gurney (Tettigoniidae), B. J. Kaston (Araneae), J. P. Kramer (Cicadellidae), L. M. Russell (Aphididae), and C. W. Sabrosky (Diptera).

Family Pompilidae

Priocnemis (P.) scitula relicta Banks

A female (8860A) 4.5 mm. long was discovered transporting her paralyzed spider prey at 1130 on August 8, 1960, in Lost River State Park. The wasp was walking backward over a shaded section of one of the trails. She held the spider upright off the ground by its hind coxae. Her prey was a half-grown jumping spider (Salticidae), *Habrocestum pulex* (Hentz), 3.5 mm. long. This spider lives on stones and in leaf litter on the ground.

Calicurgus hyalinatus alienatus (Smith)

A female (6459 B) 6.7 mm. long was found carrying her paralyzed spider prey near the cabin on Plummer's Island at 1720 on June 4, 1959. The spider was a male orb weaver (Araneidae), *Wixia ectypa* (Walck.), 5.1 mm. long.

Auplopus a. architectus (Say)

A female (82959 A) 8 mm. long was captured on Plummer's Island at 1400 on August 29, 1959. She was carrying her paralyzed spider prey, a juvenile clubionid, *Clubiona* sp., 6 mm. long.

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[1] Preceding numbers in this series were published as follows: I. Bul. Brooklyn Ent. Soc. 50: 13–17, 1955; II. Bul. Brooklyn Ent. Soc. 51: 42–44, 1956; III. Proc. Biol. Soc. Washington 71: 21–26, 1958.

[2] Entomology Research Division, Agricultural Research Service, U. S. D. A., Washington, D. C.

The hind pair of legs of the spider had been amputated by the wasp.

Episyron q. quinquenotatus (Say)

I found a female (9160 A) 9 mm. long filling in her burrow on Plummer's Island at 1430 on September 1, 1960. The burrow was in damp sand with a slope of 30° toward the Potomac River. The burrow went in at an angle of 45° and ended in cell 50 mm. below the surface. The cell contained a paralyzed male orb weaver (Araneidae), *Araneus cornutus* Clerck, 10 mm. long. When I removed the spider from the cell, the wasp egg was brushed off and damaged.

Anoplius (Lophopompilus) carolina (Banks)

I discovered a female (8260 A) 11 mm. long dragging her paralyzed spider prey along a trail through open woods in Lost River State Park at 1015 on August 2, 1960. The spider was a female agelenid, *Wadotes* sp., in the penultimate instar, 13 mm. long. During transport the wasp grasped the spider with her mandibles by the hind coxae and walked backward holding her prey in an upright position. I watched this wasp for nearly half an hour as she carried the spider to her burrow. Twice she left the spider on the bare ground while she reconnoitered the trail to her burrow. On one of these occasions she apparently forgot where she had left the spider and searched 10 minutes before finding it. Eventually she dragged the spider to the burrow entrance, which was several meters from where I first found her with her prey. I captured her and the spider at this time and then dug up her nest. The burrow began on a bare spot of earth beneath an overhanging piece of moss. The burrow was about 12 mm. in diameter and 40 mm. in length, and went downward at an angle of 45°.

Aporinellus completus Banks

A female (8860 B) 5.5 mm. long was found just as she was completing her nest in open sun along one of the trails in Lost River State Park at 1345 on August 8, 1960. The wasp was compacting the soil at the burrow entrance by patting it with the venter of her abdomen. The paralyzed spider was in a small cell barely 3 mm. below the ground level. It was a young jumping spider (Salticidae), *Phidippus clarus* Keys., 5 mm. long. The wasp egg, 1.1 mm. long and 0.5 mm. wide, was attached to the spider's abdomen. It was crushed during transport back to the cabin and dislodged from the spider.

FAMILY SPHECIDAE

Tachytes (*Tachyplena*) *crassus* Patton

A small population of this species nests in sand at the edge of the Potomac River on Plummer's Island. Apparently only a single generation occurs annually and adults are on the wing during the latter half of August. Both sexes visit flowers of swamp milk-week for nectar. On August 21, 1960, at 1500 I caught a female (82160 A) 16 mm. long on a leaf of milkweed with her paralyzed katydid nymph (Tettigoniidae), a species of *Orchelimum*, 17 mm. long. On August 27 at 1600 I saw another female (82760 A) fly to a branch of willow with a katydid. She stung her prey, adjusted it beneath her, flew to another willow branch, and was then captured. This katydid also was a species of *Orchelimum*.

Trypoxylon (*T.*) *pennsylvanicum* Saussure

I netted a female (92360 A) 8 mm. long on Plummer's Island at 1400 on September 23, 1960. She was flying with a young paralyzed orb weaver spider (Araneidae) 2.3 mm. long.

Mimesa (*M.*) *basirufa* Packard

A small population of this species nests in the flat ground adjacent to the cabin on Plummer's Island. Only a single generation occurs per year and adults are active during June. I netted one female (6459 A) 7.4 mm. long as she hovered low over the ground at 1400 on June 4, 1959. She was carrying a paralyzed leafhopper nymph (Cicadellidae) 2.6 mm. long belonging to a species of *Idiocerus*. The nymph had been paralyzed earlier by a dryinid wasp and bore a small larva of that wasp protruding between two of the abdominal terga. I caught another female (62160 A) at 1200 on June 21, 1960. She was crawling on the ground and carried a paralyzed adult leafhopper, *Macropsis viridis* (Fitch), 5.2 mm. long. On that same date I dug up a burrow of another female *basirufa*, which I did not capture. The burrow went downward at a rather steep angle to a depth of 7.5 cm. and contained several angulations. Probably the burrow was not complete, for there was neither a terminal cell nor stored prey.

Stigmus (*S.*) *americanus* Packard

I found a nest (7359 A) of this small sphecid in the pith of a dead twig of *Chionanthus virginica* L., the fringe tree, on July 3, 1959, on Plummer's Island. Apparently this was an old beetle boring that had been used earlier by the same or another species of pemphredonine wasp, for there were some dried aphid remains and six cocoon caps at the inner end of the boring. The boring varied from 1.5 to 1.8 mm. in diameter. Beyond the old cells and toward the entrance I found a number of paralyzed, tightly packed, yellowish-green nymphal and adult aphids. Those preserved for identification were a species of *Therioaphis*; they ranged from 0.8 to 1.5 mm. in length. In a space of 10 mm. there were 30 aphids and two wasp eggs. No partitions divided the prey into separate cells. The egg was sausage-shaped, 0.9 mm. long and 0.3 mm. wide, and attached lengthwise on the venter of thorax and abdomen of the aphid. Two females of *Stigmus americanus* emerged from the nest prior to August 11, 1959.

Passaloecus annulatus (Say)

A female (92459 A) 5.5 mm. long was captured at 1215 on September 24, 1959, as she hovered in front of her nest entrance in a red cedar stump on Plummer's Island. She was carrying a winged adult aphid 2.2 mm. long, *Neothomasia populicola* (Thos.).

Ectemnius (*Hypocrabro*) *continuus* (Fabricius)

I caught a female (81160 A) 12.5 mm. long at 1415 on August 11, 1960, along one of the trails in Lost River State Park. She was resting on a leaf and held a bulky, paralyzed tachinid fly, *Archytas aterrimus* (R. D.), 9 mm. long.

TORRE-BUENO'S GLOSSARY OF ENTOMOLOGY—SUPPLEMENT A

This 36 page **Supplement** now is included with each copy of the **Glossary** at the new price of $6.00—it may be secured as a separate publication for $1.00 through our Treasurer, Mr. R. R. McElvare, P. O. Box 386, Southern Pines, North Carolina.

In anticipation of additional supplements or of a complete revision of the **Glossary,** the Society invites entomologists everywhere to submit new terms and definitions as well as corrected, modified, modernized or additional definitions for terms presently found in the **Glossary** or **Supplement A.** All items should be sent to the Publication Committee in care of George S. Tulloch, 22 East Garfield Street, Merrick, N. Y.

A REVIEW OF THE GENUS WALSHIA CLEMENS WITH DESCRIPTIONS OF NEW SPECIES (LEPIDOPTERA: GELECHIOIDEA)

By Ronald W. Hodges[1]

Walshia was proposed by Clemens as a monobasic genus for *W. amorphella* Clemens. Subsequently, Chambers described a second species, *miscecolorella,* which was later treated as a synonym of *amorphella* by Walsingham (1882, Trans. American Ent. Soc. 10: 197) and all subsequent authors. Study of the male and female genitalia of specimens of the genus showed that there are five species having similar wing pattern found north of Mexico. Also, *Perimede particornella* is congeneric with *W. amorphella.*

Walshia Clemens

Type: *Walshia amorphella* Clemens, 1864. Monobasic.

Walshia Clemens, 1864, Proc. Ent. Soc. Philadelphia 2: 418.
Riley, 1869, Rep. Ins. Missouri 2: 132.
Clemens, *in* Stainton, 1872, Tineina of North America, 249.
Chambers, 1878, Bul. U. S. Geol. Geog. Surv. Terr. 4: 110.
Riley, 1886, Proc. Ent. Soc. Washington 1: 30.
Riley, *in* Smith, 1891, List of the Lepidoptera of Boreal America, 100.
Kearfott, *in* Smith, 1903, Check list of the Lepidoptera of Boreal America, 118.
Dyar, 1902 [1903], Bul. U. S. Natl. Mus. 52: 544.
Busck, 1903, Proc. Ent. Soc. Washington 5: 216.
Holland, 1903, The moth book, 430.
Walsingham and Durrant, 1909, Ent. Mo. Mag. 45: 156.
Walsingham, 1909, Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera 4: 14.
Busck, 1914, Proc. U. S. Natl. Mus. 47: 2.
Barnes and McDunnough, 1917, Check list of the Lepidoptera of Boreal America, 152.
Forbes, 1923, Cornell Univ. Agric. Exp. Sta. Mem. 68: 324.
Forbes, *in* Leonard, 1928, Cornell Univ. Agric. Exp. Sta. Mem. 101: 552.
Fletcher, 1929, Mem. Dept. Agric. India, Ent. Ser. 11: 235.
McDunnough, 1939, Mem. Southern California Acad. Sci. 2: 64.

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Labial palpi upturned slightly beyond vertex, smooth-scaled, gradually tapering to apex. Antennae simple; pecten present or absent. Ocelli present. Head smooth-scaled. Tongue well developed, scaled. Forewings lanceolate with patches of raised scales; 12 veins; 7 and 8 stalked, 7 to costa. Hindwings narrowly lanceolate; 8 veins; 2 sometimes poorly developed; 7 to costa.

Male genitalia: Valvae symmetrical or asymmetrical, fused at base, with setae on inner and outer surfaces, abundant in cucullar area, and with a series of fractures setting off dorsal, cucullar, and saccular areas. Uncus present, simple. Gnathos absent. Tegumen heavily sclerotized at juncture with vinculum, moderately sclerotized dorsally. Vinculum heavily sclerotized, partially fused with valvae. Aedeagus heavily sclerotized, ankylosed. Vesica without cornuti.

Female genitalia: Genital plate lightly sclerotized. Ductus bursae slender, lightly sclerotized. Bursa copulatrix lightly sclerotized. Signum absent. A dorsal sclerotized band connecting apophyses anteriores.

KEY TO THE SPECIES OF WALSHIA BASED UPON THE MALE GENITALIA

1. Valvae symmetrical 2
Valvae asymmetrical 5
2. Valvae sublinear (Fig. 7) .... *miscecolorella*
Valvae not linear, with well developed costal area (Fig. 6) . 3
3. Cucullar area sharply defined, constricted at base (Fig. 6) . 4
Cucullar area not well defined, no well marked lobes (Fig. 9) .... *particornella*
4. Width of cucullar area two-thirds that of valva (Fig. 6) .... *amorphella*
Width of cucular area one-third that valva (Fig. 11) .... *exemplata*
5. Cucullar area of right valva slightly smaller than that of left valva (Fig. 10) .... *similis*
Cucullar area of right valva greatly reduced (Fig. 8) . *dispar*

KEY TO THE SPECIES OF WALSHIA BASED UPON THE FEMALE GENITALIA

1. Ostium near posterior edge of genital plate (Fig. 15) .... *particornella*
Ostium near or at anterior edge of genital plate (Fig. 12) . 2
2. Heavily sclerotized band anterior to ostium (Fig. 14) .... *amorphella*

Ostium not preceded by a sclerotized band 3

3. Ductus bursae sclerotized before ostium (Fig. 12) .... *miscecolorella*
   Ductus bursae not sclerotized immediately before ostium (Fig. 16) 4
4. Midventral gap in row of setae on ovipositor (Fig. 16) .... *similis*
   No gap, or a very small one, in row of setae on ovipositor (Fig. 13) .... *dispar*

Walshia amorphella Clemens
(Figs. 3, 6, 14)

Walshia amorphella Clemens, 1864, Proc. Ent. Soc. Philadelphia 2: 419.

Riley, 1869, Rep. Ins. Missouri 2: 132.

Clemens, *in* Stainton, 1872, Tineina of North America, 241.

Chambers, 1878, Bul. U. S. Geol. Geog. Surv. Terr. 4: 110.

Walsingham, 1882, Trans. Amer. Ent. Soc. 10: 197.

Riley, *in* Smith, 1891, List of the Lepidoptera of Boreal America, 100.

Kearfott, *in* Smith, 1903, Check list of the Lepidoptera of Boreal America, 118.

Dyar, 1902 [1903], Bul. U. S. Natl. Mus. 52: 544.

Busck, 1903, Proc. Ent. Soc. Washington 5: 216.

Holland, 1903, The moth book, 430.

Walsingham and Durrant, 1909, Ent. Mo. Mag. 45: 156.

Walsingham, 1909, Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera 4: 14.

Busck, 1914, Proc. U. S. Natl. Mus. 47: 2.

Barnes and McDunnough, 1917, Check list of the Lepidoptera of Boreal America, 152.

Forbes, 1923, Cornell Univ. Agric. Exp. Sta. Mem. 68: 325. *partim.*

Fletcher, 1929, Mem. Dept. Agric. India, Ent. Ser. 11: 235.

McDunnough, 1939, Mem. Southern California Acad. Sci. 2: 64.

Walshia amorphaeella, Chambers, 1878, Bul. U. S. Geol. Surv. Terr. 4: 166, misspelling.

Face and vertex dark brown; face sometimes with lighter scales. Maxillary palpi yellow-brown, apex darker. Labial palpi yellow-brown on inner surface of second segment; third segment darker brown; apex dark brown. Antennae with pecten present. Thorax dark brown. Forewings burnished brown on a buff background;

dark brown for one-third of distance from base to apex; a broad oblique brown-buff band at one third; outer half darker than streak but paler than basal area; a dark patch of raised-scales at one-fifth below costa, another at one-fourth between fold and dorsal margin; a large light patch of raised-scales at two-fifths from costa to fold; a small patch of raised-scales at one-half between fold and dorsal margin; six small dark patches of raised-scales, evenly distributed, from tornus to apex; four small dark patches of raised-scales from three-fourths to apex along costal margin; cilia fuscous, darker between apex and tornus; a faint gray line in cilia from apex to third patch of raised-scales. Hindwings dark fuscous, cilia slightly lighter. Abdomen dark brown dorsally, shining buff under some light conditions; pale buff ventrally. Legs dark brown on outer surface, shining buff on inner surface; light gray to white rings at middle and apices of tibiae; tarsal segments light gray apically.

Male genitalia: (Fig. 6) R.W.H. slide no. 423.

Female genitalia: (Fig. 14) R.W.H. slide no. 452.

Alar expanse: 8–15 mm.

Food plant: *W. amorphella* has been reared from stem galls of *Amorpha fruticosa* L., *Hydrangea* sp., and *Salix* sp. Most of the records are of rearings on *Amorpha.*

Type: Academy of Natural Sciences, Philadelphia. Lectotype: female, bearing the following labels: (1) Ill. (2) Paratype, *Walshia amorphella,* B. Clemens, 7492. (3) *Walshia amorphella,* Type: A. B. 1902, Clemens. (4) female Genitalia Slide 561 Ronald W. Hodges.

Type locality: Illinois.

Specimens examined. 23 ♂♂, 28 ♀♀. **Illinois**: Chicago, Henry, Morton Grove, Quincy, May 28–July 17. **Kansas**: Manhatten, Medora, April 22 and May 3, reared specimens. **Kentucky**: Gallatin Co, May 23. **Minnesota**: no locality, March 1 through May 27. **Missouri**: Kirkwood, April 20 through May 3. **Nebraska**: Seward, April 26 and 27. **Texas**: Denton, April 15.

Walshia miscecolorella (Chambers)
(Figs. 2, 7, 12)

Laverna miscecolorella Chambers, 1875, Can. Ent. 7: 51.

Chambers, 1877, Bul. U. S. Geol. Geog. Surv. Terr. 3: 144.

Chambers, 1878, Bul. U. S. Geol. Geog. Surv. Terr. 4: 152.

Walsingham, 1882, Trans. American Ent. Soc. 10: 197. as synonym of *L. amorphella.*

Busck, 1903, Proc. Ent. Soc. Washington 5: 216. as synonym of

L. amorphella.

Walshia miscecolorella Riley, *in* Smith, 1891, List of the Lepidoptera of Boreal America, 100. as synonym of *W. amorphella.*

Dyar, 1902 [1903], Bul. U.S. Natl. Mus. 52: 544. as synonym of *W. amorphella.*

Laverna miscecalonella, Chambers, 1875, Can. Ent. 7: 34. *lapsus calami.*

Walshia miscecalonella, Dyar, 1902 [1903], Bul. U. S. Natl. Mus. 52: 544. as synonym of *W. amorphella.*

Barnes and McDunnough, 1917, Check list of the Lepidoptera of Boreal America, 152. as synonym of *W. amorphella.*

McDunnough, 1939, Mem. Southern California Acad. Sci. 2: 64. as synonym of *W. amorphella.*

Walshia amorphella, Riley, 1886, Proc. Ent. Soc. Washington 1: 30. misidentification.

Antennae with pecten present. Color and pattern similar to that of *W. amorphella* except for forewings often appearing more contrasting: basal patch darker brown, outer area light buff. In some Californian specimens, dark areas, except for basal patch, reduced. Light rings on hind tibiae and tarsi usually white to light buff.

Male genitalia: (Fig. 7) R.W.H. slide no. 385.

Female genitalia: (Fig. 12) R.W.H. slide no. 458.

Alar expanse: 9–16 mm.

Food plant: *W. miscecolorella* has been reared from the stems of *Lupinus arboreus* Sims, *L. chamissionis* Esch., and *Lupinus* sp.; from the roots of *Astragalus* sp. and *Arachis* sp.; and from *Cirsium vulgare* (Savi).

Type: Museum of Comparative Zoology. Lectotype: male, bearing the following labels: (1) Chambers, Tex. (2) Type, 1370. (3) *Laverna miscecolorella* Cham. (4) male genitalia slide 29.X. 1957, J.F.G.C. No. 10653.

Type locality: Bosque Co., Texas.

Specimens examined: 301 ♂♂, 82 ♀♀. **Arizona**: Paradise; Redington; Williams; South Fork Little Colorado River, White Mts.; Huachuca Mts.; Ramsay Canyon, Huachuca Mts.; Washington Mts. near Nogales; Turkey Flat, Chiricahua Mts.; Upper Camp, Pinery Canyon, Chiricahua Mts.; Santa Catalina Mts.; Tonto Creek Camp Ground, Gila Co.; Madera Canyon, Santa Rita Mts. (May 24 through September 7). **California**: Argus Mts.; Berkeley; Beverley Terrace; Bishop; Bishop Creek; Bixby Canyon, Monterey Co.; Cajon Wash, San Bernadino Co.; Chula Vista; Claremont; Clarksburg; Colusa; El Segundo; Happy Camp, Siskiyou Co.; Independence; La

Puerta; Lassen National Park; Loma Linda; Los Angeles; Marin City; Mexican Well; Mill Valley, Marin Co.; Monachee Meadows, Tulare Co.; Richmond; San Diego; San Francisco; Santa Catalina Island; Shasta Retreat, Siskiyou Co.; Tujunga; Upper Santa Ana River, San Bernardino Co.; Yosemite Valley (March 20 through November 23). **Colorado**: Colorado Springs, Fort Garland, Pike National Forest, Sangre de Cristo Range at Alpine Lodge, Rock Creek Canyon, May 26 through August 22. **Florida**: Casadaga, De Land, Gainesville, Lakeland, Siesta Key, Winter Park, January 13 through July. **Illinois**: Putnam Co., August 5. **Indiana**: Hessville, July 5. **Iowa**: Sioux City, May 6. **Kansas**: Sherlock, February 11–19, reared. **Maryland**: Cabin John, Plummer's Island, July through August. **Montana**: Bigtimber, no date. **New Mexico**: Organ Mts. at Dripping Springs, Jemez Mts., Mesilla, White Mts. at South Fork Eagle Creek, April 23 through August 13. **North Carolina**: Maxton, Pollocksville, May 15 through September 30. **Oklahoma**: Stillwater, no date. **Oregon**: Forest Grove, Joseph, Waldport, June 7 through July 21. **South Dakota**: Elk Point, August. **Texas**: Bosque Co., no date. **Utah**: Eureka, July 9 through August 20. **Washington**: Bonneville, Pullman, Rochester, Seattle, Walla Walla, Yakima, May 25 through August 17. **Alberta**: Lethbridge, July 4–13. **British Columbia**: Kamloops, Shingle Creek, June 8 through August 5. **Manitoba**: Aweme, Winnipeg, June 13 through July 25. **Saskatchewan**: Indian Head, Saskatoon, July 13 through August 4.

Walshia similis, n. sp.
(Figs. 4, 10, 13)

Labial palpi fuscous, no yellow shades. Antennae with pecten absent. Coloration and maculation of wings similar to *W. amorphella,* often appearing washed-out.

Male genitalia: (Fig. 10) R.W.H. slide no. 466. Valvae normally symmetrical, sometimes asymmetrical.

Female genitalia: (Fig. 13) R.W.H. slide no. 454.

Alar expanse: 8–12 mm.

Food plant: unknown.

Types: Holotype: male, Cherry Hill Recreation Area, Route 107, Oconee County, South Carolina, 2000 feet, August 20, 1958 (R. W. Hodges), [Cornell University Type No. 3647]. Paratypes: Cherry Hill Recreation Area, Route 107, Oconee County, South Carolina, 2000 feet, 8 ♀♀, August 17 through September 7, 1958 (R. W. Hodges); East River, Connecticut, 1 ♀, August 1910

(Chas. R. Ely); Putnam Co., Illinois, 2 ♀♀, June 24, 1956 and August 12, 1949 (M. O. Glenn); Martha's Vineyard, Massachusetts, 1 ♂, August 22, 1941 (F. M. Jones); Essex Co. Park, New Jersey, 2 ♂♂, July 30 and August 16 (W. D. Kearfott); New Lisbon, New Jersey, 2 ♀♀ (E. P. Darlington); Oakland, New Jersey, 6 ♂♂, 2 ♀♀, August 4–14, 1948 (C. P. Kimball); Ramsey, New Jersey, 1 ♂, 1 ♀, August 2, 1935; Highlands, Macon Co., North Carolina, 2 ♀♀, August 10 and 23, 1958 (R. W. Hodges); Leland, North Carolina, 2 ♀♀, September 1 and 3, 1946 (Otto Buchholz); Maxton, North Carolina, 5 ♂♂, 1 ♀, August 5 through September 30, 1943 and 1944 (A. B. Klots); Pollocksville, North Carolina, 1 ♂, September 15, 1931 (Bradley and Knorr); Clermont Co., Ohio, 1 ♂, August 19, 1920 (Annette F. Braun).

Other specimens examined: 8 ♂♂, 9 ♀♀. **Connecticut**: Putnam, August 29. **Illinois**: Putnam Co., June 24. **Michigan**: Livingston Co., July 29 through August 17. **New Jersey**: Oakland; Ramsey, July 17 through August 14. **New York**: Tuxedo; Woodlands, August 7–25. **North Carolina**: Maxton; Pollocksville, June 1 through September 15. **Pennsylvania**: New Brighton, July 13. **Virginia**: Lexington, September 11.

Paratypes have been deposited in the following collections: American Museum of Natural History; California Academy of Sciences; Cornell University; Los Angeles County Museum; Academy of Natural Sciences, Philadelphia; United States National Museum; A. F. Braun; M. O. Glenn; C. P. Kimball; A. B. Klots; and R. W. Hodges.

W. similis can be separated from *W. amorphella, W. miscecolorella,* and *W. exemplata* by the asymmetry of the valvae and by the sharp constriction at the base of the cucullar areas in the male genitalia. It can be separated from *W. dispar* by the degree of asymmetry: the valvae of *similis* are nearly equal in size, whereas the right valva of *dispar* is about two-thirds the size of the left valva.

Walshia dispar, n. sp.

Walshia amorphella

Forbes, 1923, Cornell Univ. Agric. Exp. Sta. Mem. 68: 325. misidentification, *partim.*

Forbes, *in* Leonard, 1928, Cornell Univ. Agric. Exp. Sta. Mem. 101: 552. misidentification, *partim.*

Labial palpi fuscous, no yellow shades. Antennae with pecten absent. Maculation of wings similar to *W. amorphella.*

Male genitalia: (Fig. 8) R.W.H. slide no. 464.

Female genitalia: (Fig. 16) R.W.H. slide no. 496.

Alar expanse: 10–13 mm.

Food plant: unknown.

Types: Holotype: male, Six Mile Creek, Ithaca, New York, July 17, 1957 (J. G. Franclemont), [Cornell University Type No. 3646]. Paratypes: Six Mile Creek, Ithaca, New York, 16 ♂♂, 6 ♀♀, June 20 through August 14 (J. G. Franclemont); East River, Connecticut, 1 ♂, August 17, 1909 (Chas. R. Ely); Essex Co. Park, New Jersey, 2 ♂♂, July 22 and 30 (W. D. Kearfott); Great Falls, Virginia, 1 ♂, July 31, 1919 (A. Busck); Hot Springs, Virginia, 1 ♀, August 11, 1916 (M. Hebard).

Other specimens examined: 4 ♂♂, 1 ♀. **New Jersey:** Essex Co., August 2. **New York:** Ithaca, July 18 through August 6. **Ontario:** Ottawa, July 26.

Paratypes have been deposited in the following collections: California Academy of Sciences; Cornell University; Los Angeles County Museum; Academy of Natural Sciences, Philadelphia; United States National Museum; J. G. Franclemont; and R. W. Hodges.

W. dispar can be separated from the other species of the genus by the extreme asymmetry of the male genitalia. The right cucullar area is reduced to one-third that of the left.

Walshia exemplata, n. sp.

(Fig. 11)

Labial palpi fuscous. Antennae with pecten absent. Superficially this species is like *W. amorphella* in maculation.

Male genitalia: (Fig. 11) R.W.H. slide no. 460.

Female genitalia; no specimens available.

Alar expanse: 13 mm.

Type: Holotype: male, Plummer's Island, Maryland, July 1902 (A. Busck), [Los Angeles County Museum].

W. exemplata can be distinguished from *W. amorphella, W. miscecolorella, W. similis,* and *W. dispar* by having symmetrical valvae with well defined cucullar areas that are one third the width of the valvae.

Walshia particornella (Busck), new combination.

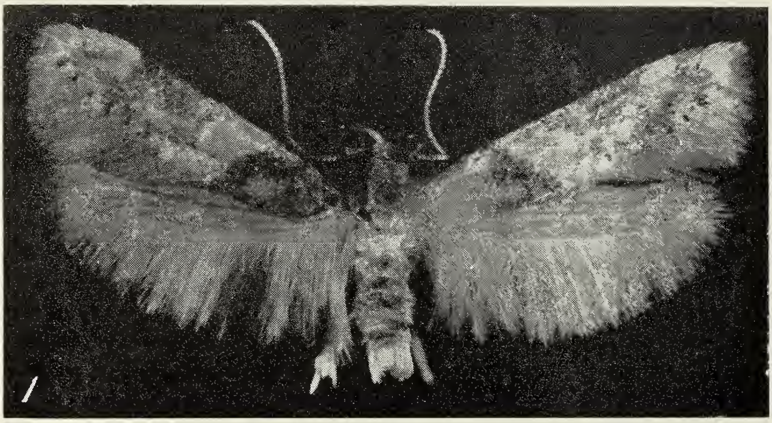
(Figs. 5, 9, 15)

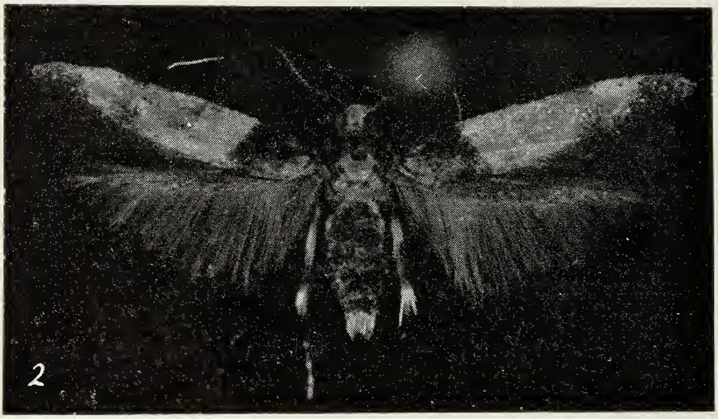
Perimede particornella Busck, 1919, Proc. Ent. Soc. Washington 11: 96.

Barnes and McDunnough, 1917, Check list of the Lepidoptera of Boreal America, 152.

McDunnough, 1939, Mem. Southern California Acad. Sci. 2: 64.

HODGES PLATE I

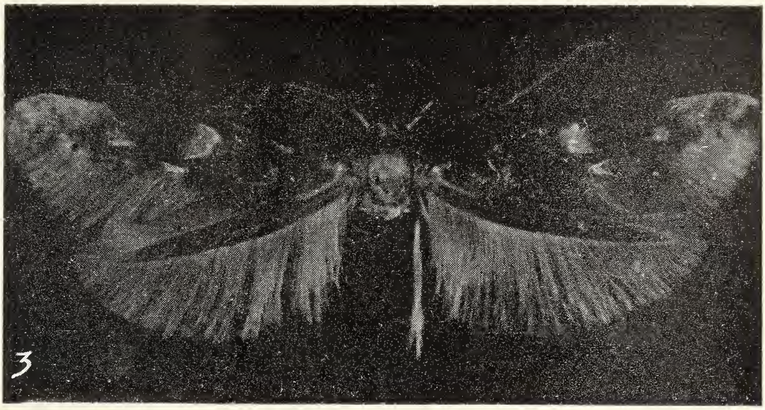




EXPLANATION OF PLATES I AND II

Fig. 1, *Walshia dispar,* n. sp., holotype, male, Six Mile Creek, Ithaca, New York. Fig. 2, *W. miscecolorella* (Cham.), male, Madera Canyon, Santa Rita Mountains, Arizona. Fig. 3, *W. amorphella* Clemens, female, Putnam Co., Illinois. Fig. 4, *W. similis,* n. sp., holotype, Oconee Co., South Carolina. Fig. 5, *W. particornella* (Busck), male, Putnam Co., Illinois.

HODGES PLATE II



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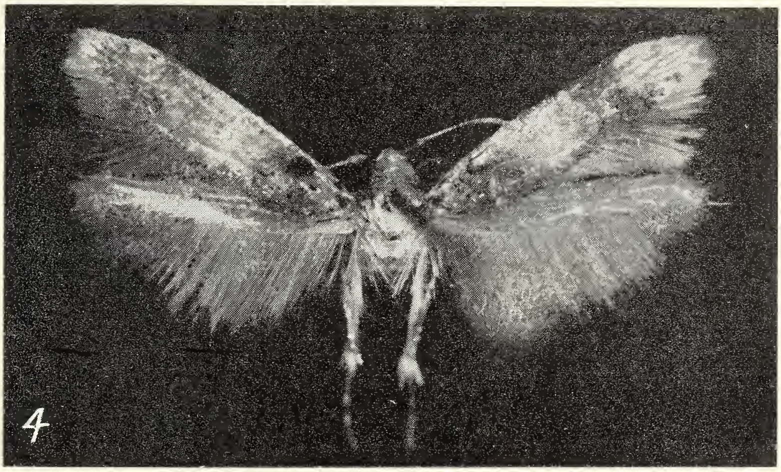

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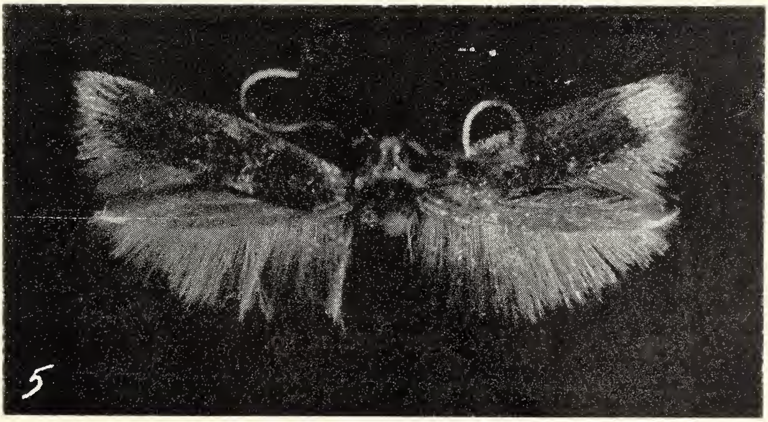
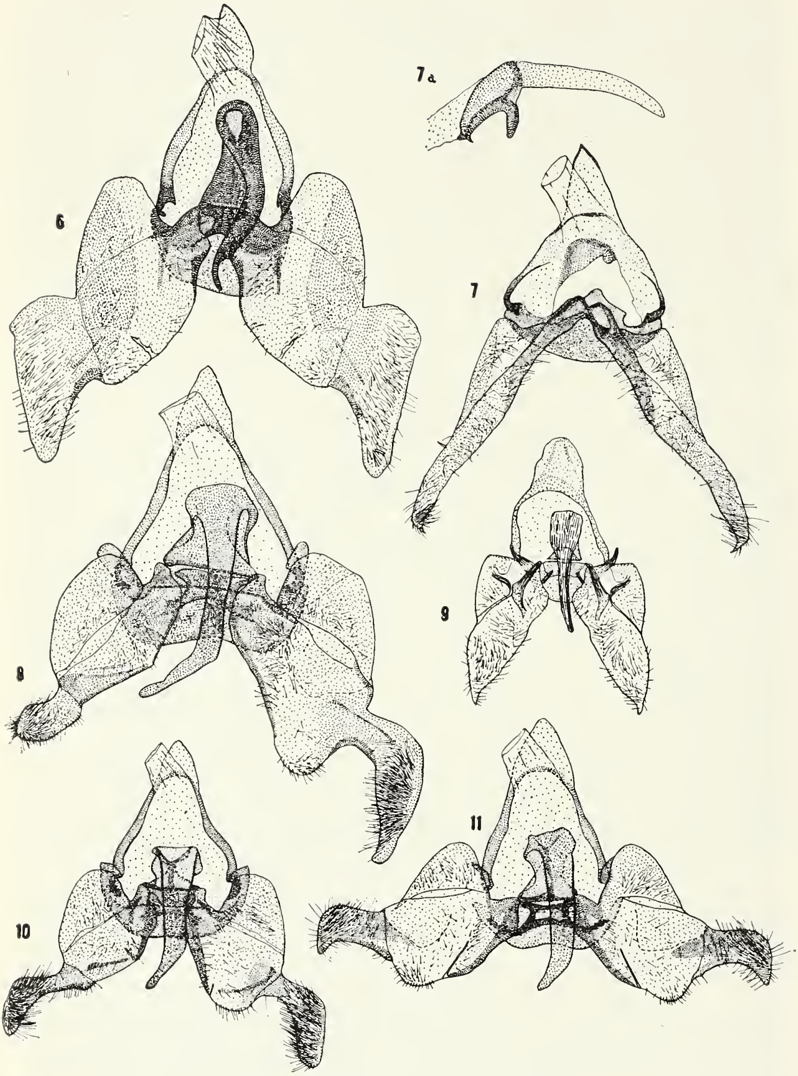


5

HODGES PLATE III



EXPLANATION OF PLATE III

Figs. 6–11, Ventral view of male genitalia of *Walshia.* Fig. 6, *W. amorphella.* Fig. 7, *W. miscecolorella* (Cham.). Fig. 8, *W. dispar,* n. sp. Fig. 9, *W. particornella* (Busck). Fig. 10, *W. similis,* n. sp. Fig. 11, *W. exemplata,* n. sp.

The male genitalia indicate that this species is not congeneric with *Perimede erransella* Chambers, the type of *Perimede.*

Male genitalia: (Fig. 9) R.W.H. slide no. 18. In Fig. 9 the basal part of the tegumen does not meet the vinculum; this is a result of the preparation.

Female genitalia: (Fig. 15) R.W.H. slide no. 500.

Alar expanse: 8–12 mm.

Type: United States National Museum.

Type locality: Plummer's Island, Maryland.

Specimens examined: 14 ♂♂, 2 ♀♀. **Illinois:** Putnam Co., June 4 through July 15. **Maryland:** Plummer's Island, July. **Texas:** Devers, June 21. **Virginia:** Alexandria, May 27.

The holotype and series of paratypes of *W. similis* from Highlands, North Carolina and Oconee Co., South Carolina were collected during the summer of 1958 when the author was assisting Dr. J. G. Franclemont. The collecting was done under the auspices of a grant from the Penrose Fund of the American Philosophical Society.

The outline maps are from the Goode Base Map Series published by the University of Chicago (Copyright by the University of Chicago.)

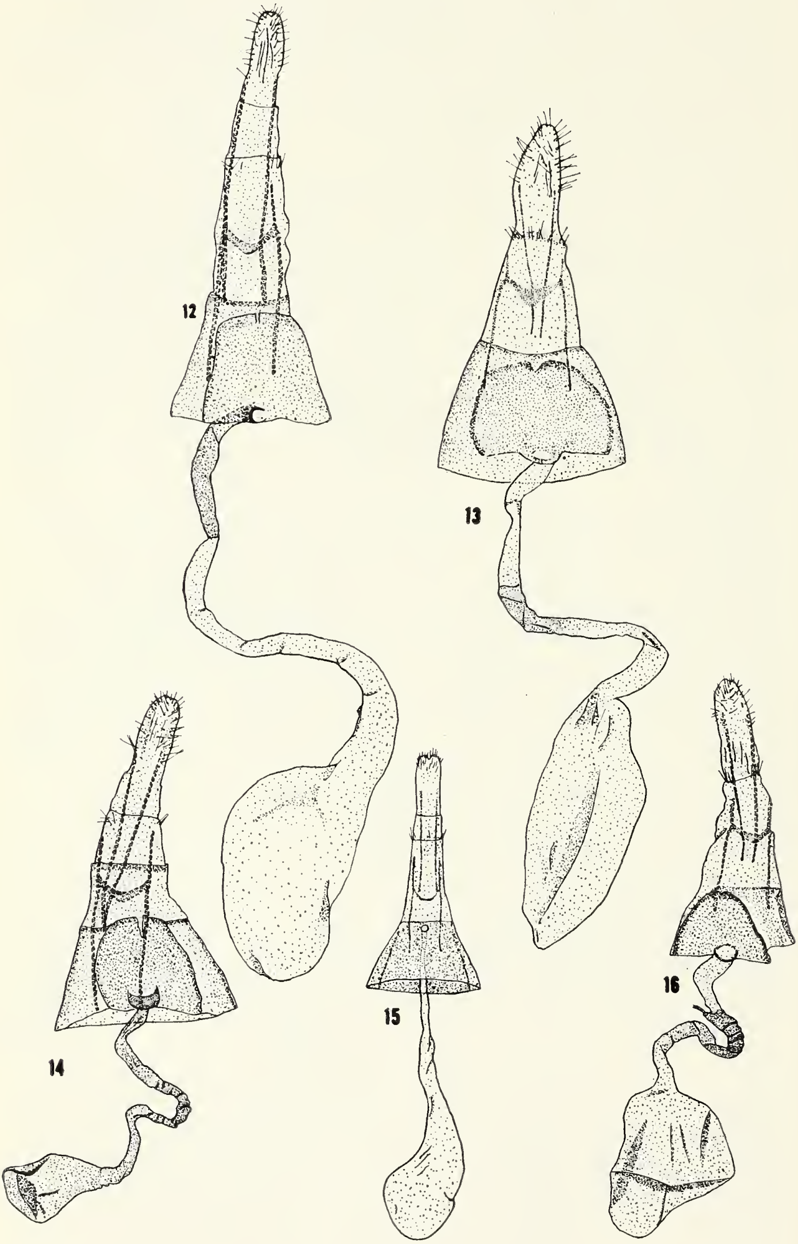
The author wishes to thank the following persons and institutions for furnishing the specimens which form the basis of this study: American Museum of Natural History; California Academy of Sciences; Canadian National Collection; Chicago Museum of Natural History; Cornell University; Illinois Natural History Survey; Los Angeles County Museum; Museum of Comparative Zoology; Philadelphia Academy of Sciences; United States National Museum; University of California at Berkeley; University of Michigan; Dr. Annette F. Braun; Dr. J. G. Franclemont; Mr. M. O. Glenn; Mr. C. P. Kimball; Dr. A. B. Klots; and Mr. J. A. Powell.

Grateful acknowledgment is made to the Grace H. Griswold Fund of the Department of Entomology of Cornell University for assuming the expense of engraving the plates.

EXPLANATION OF PLATE IV

Figs. 12–16, Ventral view of female genitalia of *Walshia.* Fig. 12, *W. miscecolorella* (Cham.). Fig. 13, *W. similis,* n. sp. Fig. 14, *W. amorphella* Clemens. Fig. 15, *W. particornella* (Busck). Fig. 16, *W. dispar,* n. sp.

HODGES PLATE IV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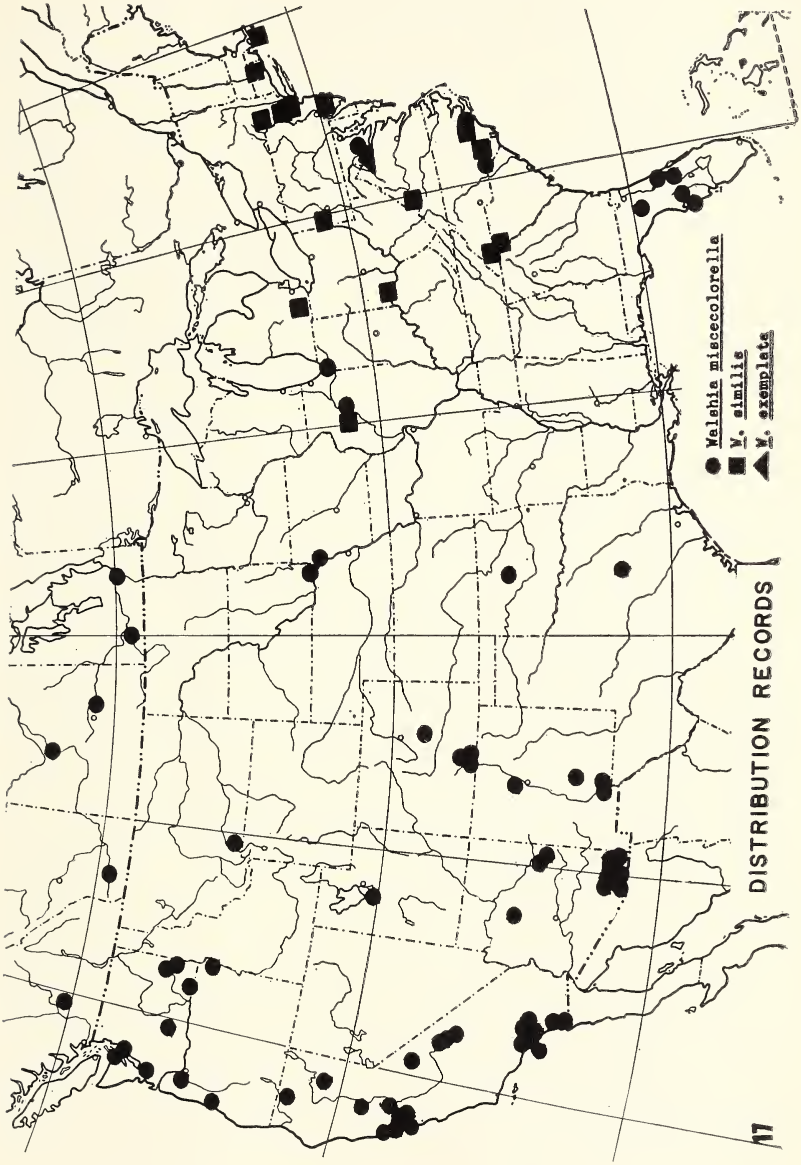
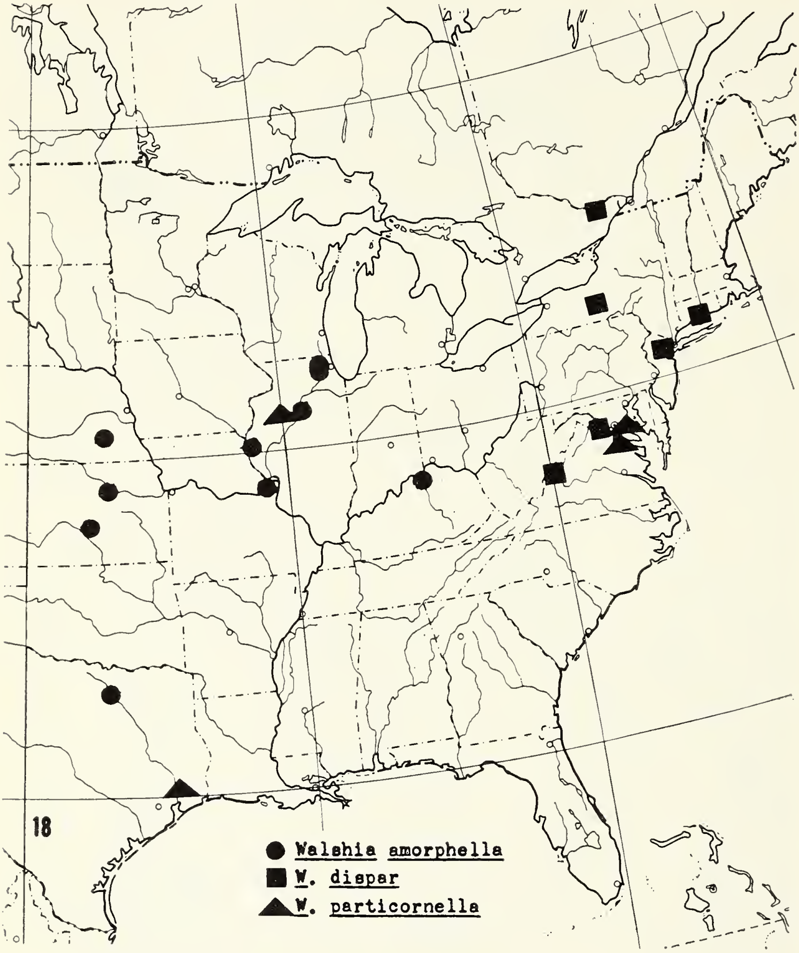
HODGES PLATE V


● Walshia miscecolorella
■ W. similis
▲ W. exemplata
DISTRIBUTION RECORDS
17

HODGES PLATE VI


18
● Walshia amorphella
■ W. dispar
▲ W. particornella

DISTRIBUTION RECORDS

INSECTS FROM TUNNELS OF *XYLOCOPA VIRGINICA* (LINN.) (COL., LEP., DIPT., HYM.)

By W. V. Balduf, University of Illinois, Urbana[1]

On September 17, 1957, I dissected a four-foot long piece of 1 × 4 in. pine board that had housed a part of a colony of the carpenter bee, *Xylocopa virginica* on a garage at Longview, Champaign County, Illinois. Representatives of six species of other insects were then present. Excepting the cocoons of *Osmia lignaria* reported below, all the insects were then dead, possibly due to plugs of putty the owner had placed into the entrances of the tunnels to discourage the carpenter bee.

Following are the species involved, plus the gist of published biologies and my own observations on the materials found in the tunnels.

Coleoptera

Ahasversus advena (Waltl.), Cucujidae. Four adults.

Trogoderma glabrum (Herbst), Dermestidae. A living advanced larva, and exuviae.

Lepidoptera

Nephopteryx subcaesiella (Clem), Phycitidae. The material consisted of three imperfect adults, one chrysalis and 25 individuals; some of the latter were obviously still larvae, whereas nine appeared to have developed abnormally beyond the larval state. The latter nine are remarkable in that the head and thorax retain the larval form, texture and appendages typical of caterpillars whereas the abdomen has assumed the characteristic color, form and texture of chrysalids.

In his report to me on the identity of the wasps and bees, Mr. Krombein commented that the above *Nephopteryx* "probably were prey of a solitary vespid wasp." This may explain the partial transformation of the nine *subcaesiella*. Assuming that the wasp takes only caterpillars, the presence of a chrysalis and adults in the tunnel could mean that these, as larvae, were paralyzed lightly or temporarily, and thus recovered enough to complete their transformation in the tunnel. On the other hand, the nine half-transformed individuals, when seized by the wasp, were paralyzed more seriously, so that the head and thorax were deadened, yet the abdomen received little or no venom, and therefore proceeded to pupate. It is of interest also that these individuals retained the larval cuticle intact over the entire body, perhaps because the anterior body regions, where molting begins, were incapacitated by paralysis.

---

[1] I am indebted to specialists at the U. S. National Museum for identification of the insects concerned here.

Reference to the biologies of eumenine vespid wasps cited by Muesebeck, et al (1951, 1958) indicate that either *Pseudodynerus quadrisectus* (Say) (Rau, 1935) or *Monobia quadridens* (Linn.), (Ashmead, 1894; Rau, 1931; Frost, 1944) could have stored the *Nephopteryx* larvae in the tunnels of *X. virginica* at Longview, Illinois. Both utilize caterpillars as prey, and are known to nest sometimes in tunnels of this carpenter bee.

Since several species of *Nephopteryx* are known pests of plants—some as leaf-tiers (Rev. App. Ent., A, 1913–1958), it may be assumed that *N. subcaesiella* at Longview occurred on one of the many ornamental plants grown near the nest of *X. virginica.*

DIPTERA

Tachinidae. Two adults, in poor condition, and several puparia of a fly that occurred in one of the tunnels, were identified doubtfully as Tachinidae. The larvae possibly parasitized some of the caterpillars of the above *Nephopteryx.*

HYMENOPTERA

Trypoxylon striatum Prov. (*T. albopilosum* Fox), Sphecidae. My materials of this solitary wasp consisted of nine cocoons. Each contained a dead, yet not decomposed limp apodous yellow prepupa with prominent mandibles. All occurred in abandoned tunnels of *X. virginica,* each in a cell walled off from adjacent cells by partitions of mud. One tunnel contained a series of eight cells and shrivelled immature larvae. Another housed eleven cells in a series; each of the four older or innermost cells contained a *Trypoxylon* cocoon.

The cocoon is described by Krombein (1956) as "made of a thin layer of tightly woven pale silk impregnated with a fluid, possibly of meconial origin, which dries to form a varnished, brittle, dark brown substance." My specimens are round and somewhat bulbous at the posterior end; narrower and cylindrical in the median half, and flared out at the cephalic end, which is transversely flattish-convex. One cocoon measured 16 mm. long, 6.0 mm. in diameter at the round end, 5.5 mm. in the median part and 5.4 at the flattish end. The corresponding dimensions of a second cocoon were 15.5, 5.5, 4.5 and 5.0 mm.

The biology of *T. striatum* was made known by Rau (1928), G. W. and E. G. Peckham (1895, 1895) and Krombein (1956). It nests in bee burrows in wood or ground, and utilizes only spiders, and particularly Epeiridae. The eggs are placed, one per cell, on the abdomen of the spider. According to Krombein, this species apparently develops only one generation a year.

Osmia lignaria Say, Megachilidae. In the spring of 1956, a female was discovered carrying pollen into an old tunnel of *X. virginica.* She was first seen at work on April 27 and again on six later dates to May 10. On the posterior venter of the abdomen, she invariably bore pale yellowish-white pollen, but later in the period returned several times without a load. She remained inactive on May 7, when the atmospheric temperature stood near 50° F.

The bee worked rapidly and steadily. The round trip from the nest board to the flower garden, located about 50 feet away, and back to the nest board required 4.5 to 5.5 minutes. This included acquisition of the load of pollen. After each return, 1.0 to 1.5 minutes were spent in the nest in depositing pollen. The outcome of all this activity was not observed.

A second opportunity to learn about *O. lignaria* came in 1957–58. Dissection of a four-feet long nest board of *Xylocopa virginica* on September 17, 1957, revealed two dead dry adult *O. lignaria* in an old tunnel. These may have been the progenitors of 12 cocoons found on the same day in another burrow of the same piece of nest board. The cocoons are elongate-oval, shaped much like a football. A tangle of silk envelops the medium brown cocoon. They varied from 10 to 13 mm. in length and 5–7 mm. in maximum diameter. Two of the cocoons opened on September 18, 1957 contained mature living adults.

The remaining 10 cocoons were placed in a cage on September 19, and subjected to natural weather conditions at Urbana through the winter. On and about April 21, 1958, eight adult *Osmia* emerged from the cocoons. The other two then contained dead pupae. Emergence took place through the side of the cephalic third of the cocoon. The above time data indicate that *O. lignaria* completes one generation in a year in central Illinois.

Linsley and McSwain (1941) note the wide distribution of *lignaria* in North America, the nesting sites chosen, the construction of the nests, storage of pollen in the cells and the development from egg to adult in California. As in Illinois, this bee passes the cold season as adult in the cocoon. Hicks (1934) suggests this manner of wintering may be general among certain of the Osmias, and includes *O. l. propinqua* Cress. in this group. In California (Linsley and McSwain), the adults emerge in February and March,—decidedly earlier than in Illinois.

Osmia lignaria is sometimes involved in supersedure with *O. californica* Cress. Bohart (1955) describes two types of this phenomenon,—abrupt, in which a series of brood cells started by *lignaria* is completed by *californica,* and gradual, where both species work simultaneously for a period in the same nest.

SUMMARY

Six species of insects inhabited the abandoned tunnels of a colony of carpenter bees, *Xylocopa virginica* that nested in a fascia of a garage at Longview, Illinois. The Coleoptera, *Ahasversua advena* (Waltl.) Cucujidae and *Trogoderma glabrum* (Herbst), Dermestidae, were present in small numbers. The phytophagous larvae of a phycitid moth, *Nephopteryx subcaesiella* (Clem.), had been stored by a wasp,—probably an eumenine vespid. Puparia of a tachinid ? sp. may have represented parasites in the larvae of *Nephopteryx.* A spider-storing sphecid wasp, *Trypoxylon striatum* Prov. was identified from its cocoons and brood cells. All the above materials were found dead. However, the megachilid bee, *Osmia lignaria* Say was seen storing pollen in an old *Xylocopa* burrow in one instance; in another, adults emerged in spring from a series of cocoons that contained fully-developed adult *Osmia* in the previous fall.

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STUDIES ON THE PLECOPTERA OF NORTH AMERICA: IX. *CAPNIA MANITOBA* IN THE NORTHEAST[1]

J. F. Hanson[2] and S. W. Hitchcock[3]

The genus *Capnia* is generally considered to be a western genus of North American stoneflies. Of approximately 45 North American species, only three have been reported in the eastern part of the continent: *C. labradora* Ricker (1954) and *C. vernalis* Newport from Labrador and northern Quebec (Brinck, 1958), and *C. nearctica* Banks from the Canadian far north (Ricker, 1944, 1954).

No species of *Capnia* have been recorded from the United States east of Minnesota. Therefore, we were very much surprised when we separately collected specimens of *Capnia manitoba* Claassen in New England. This particular species had not previously been reported east of Manitoba.

---

[1] Supported by NIH Grant E-1442(C5), U. S. Public Health Service. Contribution No. 1344 from the entomological laboratory of the University of Massachusetts.

[2] Department of Entomology and Plant Pathology, University of Massachusetts, Amherst, Mass.

[3] The Connecticut Agricultural Experiment Station, New Haven, Conn.

Its presence in the Northeast first came to the attention of the senior author in 1953 (when Dr. John A. Weidhaas of Cornell then a graduate student at the University of Massachusetts collected a pair). It was such a surprise to find that *Capnia* occurred in New England that he had to be assured and reassured that the specimens had indeed been collected so embarrassingly close to Amherst. When he finally did find time to make a field trip to collect some specimens, the season for adults had passed. However, in 1954 he collected many specimens at the designated location, so there could no longer be the slightest doubt as to the occurrence of at least one breeding population of *Capnia* in Massachusetts.

The junior author added another State to the eastern distribution of *C. manitoba* by collecting a number of specimens in Connecticut in 1959. Then in the spring of 1961, still another eastern State was added to the list when the senior author, on the very first stop of an early spring collecting trip, happened on this species in Saco, Maine.

Collecting Notes and Comments.—Since the insects of literally hundreds of streams in the Northeast have been intensively collected for many years by a number of entomologists, it seems quite certain that *C. manitoba* is a relatively rare or highly localized species. However, it is apparently an unusually active species and therefore its presence might go undetected by the common method of collecting adult Capniidae in winter and early spring.

Allocapnia and *Paracapnia* so rarely fly, even on the warmest spring days, that they are best collected by plucking them from boulders in the streams, from snow along the stream banks, or from fence posts and roadside or bridge railings near streams. The fence posts and railings are particularly wonderful collecting places for our commonest eastern genus, *Allocapnia.* Both males and females have a tendency to travel upward after emergence from the water, and thus, are virtually trapped when they reach the top of the railing where they may easily be collected. Here they run back and forth on the railings accumulating in greater and greater numbers as the emergence season progresses.

Capnia manitoba, on the other hand, was observed by Dr. Weidhaas to be actively flying in considerable numbers about the meadow when he made the initial eastern collection of this species. Thus, the adults would probably be normally widely dispersed about their habitat rather than concentrated in particular places. They might, therefore, better be detected and collected by sweeping the vegetation, even on cold wintery days, rather than by searching on the fence posts. Consequently, it seemed appropriate to make further observations on the habits and local dispersal of the adults in the next season.

Unfortunately, on both occasions when the senior author made observations and collections at the Massachusetts location, the weather was cool and windy and flight was not observed. The disposition of the specimens collected was nonetheless of considerable interest, indicating that *C. manitoba* had probably been flying about the meadow on other days of that same spring and that it would be indeed easy to overlook this species if only the fence posts were scrutinized for specimens. Of the 147 specimens taken on 23 March 1954, only two were taken on the fence posts where the stream flows under the road; all the rest were swept with a net from the dead or overwintering grass of the meadow. In contrast, of the 20 *Allocapnia* specimens taken, 10 were taken from the fence posts. The specimens from Connecticut were also collected by sweeping dead grass and reeds and so provide supporting evidence for the observations made in Massachusetts.

In subsequent years the species was not recovered in Massachusetts, probably because of the activities of certain agrarian members of the *Homo sapiens* species who deliberately relocated the stream.

Collection Data.—Connecticut: west branch of Bantam River, Goshen, 1 Apr. 1959 (S. W. Hitchcock) 16♂♂ 2♀♀. Maine: Saco, Route 5, 3 Apr. 1961 (J. F. Hanson) 9♂♂ 2♀♀. Massachusetts: Westhampton, trib. Roberts Meadow Brook, 1♂ 1♀ on 23 Mar. 1953 (J. A. Weidhaas), 12♂♂ 14♀♀ on 18 Mar. 1954 (J. F. Hanson), 87♂♂ 60♀♀ on 23 Mar. 1954 (JFH).

These extensions of the known range of *C. manitoba* suggest the interesting possibility that other species of *Capnia* may be found in highly localized breeding areas in New England or Northeastern New York.

ACKNOWLEDGEMENT

The authors are indebted to Dr. Edward I. Coher for critically reading and correcting the manuscript.

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NEW DELAWARE RECORDS FOR MAMMALIAN ECTOPARASITES, INCLUDING SIPHONAPTERA HOST LIST[1]

By Edward E. Tindall and Richard F. Darsie, Jr.[2]

The present study is a continuation of the ectoparasite work started by MacCreary (1945a) and Florschultz and Darsie (1960). Seven new species records and three new host records for Delaware were obtained from three species of mammalian hosts and an apparently abandoned poultry house. One species of mite was found for the first time on the white-footed mouse *Peromyscus leucopus noveboracensis* (Fischer). Detailed locality records for four additional ectoparasites are also included.

---

[1] Published as Miscellaneous Paper No. 376 with the approval of the Director of the Delaware Agricultural Experiment Station. Publication 312 and Scientific Article 228 of the Department of Entomology, September, 1960.

[2] Graduate Assistant and Associate Professor, respectively, Department of Entomology, Delaware Agricultural Experiment Station, Newark. The authors are indebted to Dr. James M. Brennan, Rocky Mountain Laboratory, U. S. Public Health Service, Hamilton, Montana; Dr. E. W. Jameson, Jr., Department of Zoology, University of California, Davis, California, and Dr. Edward W. Baker, U .S. National Museum, Washington, D. C. for aid in identification of mites; to Dr. Edwin F. Cook, Department of Entomology and Economic Zoology, University of Minnesota, St. Paul, Minnesota, for aid in identification of immature lice; to Lt. Col. Robert Traub, U. S. Army Medical Research and Development Command, Washington, D. C., and Dr. Henry Dietrich, Department of Entomology, Cornell University, Ithaca, New York for furnishing Delaware fleas; and to Dr. Paul P. Burbutis, Department of Entomology, University of Delaware for assistance with flea determinations.

PROCEDURE

The ectoparasite recovery technique used in this study was modified from that of Race (1956). Sherman live traps, baited with apple or peanut butter, were employed in capturing the mammals alive. The rodents and shrews were all taken during the spring and fall of 1959. The live animal, once caught, was transferred from the trap to a clear plastic bag. Only one animal was placed in each bag.

Upon returning to the car the mouth of this bag was held firmly around the exhaust pipe, while the car engine was running. This rapidly asphyxiated its occupant. The animal was transferred immediately to a quart jar half filled with water and containing 4 to 5 drops of 25% lindane emulsifiable concentrate, and about one-half teaspoon of commercial detergent. The cap was replaced securely and the jar and contents shaken vigorously ten to twenty times. The plastic bag was resealed, labeled and placed with the jar.

The jar was agitated once again after returning to the laboratory; this time, however, it was shaken approximately a hundred times or more. The animal was removed and rinsed over a 60 mesh sieve, examined closely for remaining parasites, identified and discarded. The liquid and material in the jar was passed through the sieve and rinsed with clean water several times, each time pouring it through the sieve. The sieve was inverted and back-washed by water or alcohol into one or several watch glasses. The contents were inspected under a microscope and the parasites segregated. The mites were mounted immediately, while the lice and fleas were preserved in 70 percent alcohol to be processed and mounted later. The inside of the bag was examined for any parasites which might have left the host during its short stay therein.

The mites were mounted in Hoyer's solution and cleared over heat (Baker & Wharton, 1952). The Hoyer's solution plus the heat tended to relax the specimen and spread the legs, often a key feature in identification. The lice and fleas were cleared in 10% KOH, rinsed in three changes of distilled water, dehydrated in 50 percent then 100 percent ethyl cellosolve, and mounted directly in Canada balsam. The authors follow the classification of Class Mammalia by Hall and Kelson (1959).

RESULTS

A total of 39 animals was examined for ectoparasites, all but one of which were taken from the Newark area of New Castle County.

The mammals were: one gray squirrel, *Sciurus carolinensis pennsylvanicus* Ord; six shorttailed shrews, *Blarina brevicauda talpoides* (Gapper); and 32 white-footed mice, *P. l. noveboracensis.* The gray squirrel was taken in Thompsonville, Kent County. In addition, eight fleas were collected from Hartly, Kent County, by Donald MacCreary in an abandoned poultry house, so that the host is unknown.

A total of 773 ectoparasites was recovered from the small mammals but it is doubtful that all of the parasites were removed from the hosts. One hundred and nineteen ticks were recovered but not included in this study since MacCreary (1945b) has already adequately treated this group.

Approximately one-half of the ectoparasites, other than ticks, were identified to species. These are listed in Table 1, including percent of hosts infested.

Acarina

Blarinobia simplex (Ewing).—Newark, New Castle Co., *ex B. b. talpoides,* 10 Nov. 1959, 1 ♀; 20 Nov. 1959, 9 ♀♀; ex *P. l. noveboracensis,* 11 Dec. 1959, 3 ♀♀ (E. Tindall). This comprises a new host record as well as a new State record for Delaware. Jameson (1948) described it from the soricid shrews, *B. brevicauda* and *Sorex cinereus* Kerr but not from *P. leucopus.* The original description of this genus and species was made by Jameson (1955). As far as the authors can determine, this is the first record of *B. simplex* occurring on white-footed mice. This mite appears to be specific for shrews and it may be an accidental infestation picked up in common runways. Jameson and Brennan (1957) noted that a variety of shrews, mice and other small mammals frequently utilized the same trails and tunnels in the turf and humus.

Euschongastia blarinae (Ewing).—Newark, New Castle Co., ex *B. b. talpoides,* 10 Nov. 1959, 1; 20 Nov. 1959, 7 (E. Tindall). Farrell (1956) described this mite and noted that all known collections of *E. blarinae* have been from shrews with but a single exception. That exception is the type specimen recorded from *P. leucopus,* the white-footed mouse. *E. blarinae* is a new record for Delaware.

Euschongastia peromysci (Ewing).—Newark, New Castle Co., ex *P. l. noveboracensis,* 18 Mar. 1959, 2; 19 Mar. 1959, 4; 20 Mar. 1959, 14; 24 Mar. 1959, 8; 26 Mar. 1959, 8; 6 Apr. 1959, 2; 8 Apr. 1959, 3; 9 Apr. 1959, 4; 11 Apr. 1959, 2; 13 Apr. 1959, 7; 19 Apr. 1959, 2; 20 Apr. 1959, 6; 21 Apr. 1959, 1; 22 Apr. 1959, 2; 23 Apr. 1959, 2; 28 Apr. 1959, 2; 4 May 1959, 3; 9 Dec. 1959, 11; 11 Dec.

Table 1. Numbers of Ectoparasites and Percent of Hosts Infested, Delaware, 1959*

Parasite	*Peromyscus leucopus*		*Blarina brevicauda*		*Sciurus carolinensis*		Total
	Total No.	Per. Hosts Infested	Total No.	Per. Hosts Infested	Total No.	Per. Hosts Infested	
ACARINA							
Blarinobia simplex	3	3	10	33			13
Euschongastia blarinae			8	33			8
E. peromysci	87	78					87
Hirstionyssus carnifex	2	3	2	17			4
Resinacarus spp.	2	6	1	17			3
Haemolaelaps glasgowi	38	53	2	17			40
ANOPLURA							
Hoplopleura hesperomydis	35	(adults) 41					35
	11	(nymphs) 9					11
SIPHONAPTERA							
Doratopsylla blarinae	2	6	32	83			34
Epitedia wenmanni	9	19					9
Orchopeas h. howardii					14	100	14
Orchopeas leucopus	36	38					36
Stenoponia americana	7	16					7
	232		55		14		301

* In addition, *Pulex i. irritans* was collected from an abandoned poultry house.

1959, 5 (E. Tindall). Farrell (1956) described this mite in detail and gave an extensive host list of shrews and rodents. Jameson and Brennan (1957) noted that this mite, though found throughout the year, was far less common during the summer months. They also considered this true for chiggers in general. According to these same authors, *E. peromysci* is most often found deep in the ear conch of its host. They found it much more common on forest inhabiting *Peromyscus* as compared with a brushfield habitat. Our mice were all trapped in hardwood forest. This chigger is also a new record for Delaware.

Haemolaelaps glasgowi (Ewing).—Newark, New Castle Co., ex *B. b. talpoides,* 6 Apr. 1959, 2 ♀♀; ex *P. l. noveboracensis,* 16 Mar. 1959, 12 ♀♀, 1 nymph; 19 Mar. 1959, 2 ♀♀; 20 Mar. 1959, 2 ♀♀; 26 Mar. 1959, 1 ♀; 6 Apr. 1959, 1 ♀; 8 Apr. 1959, 1 ♀; 9 Apr. 1959, 1 ♀; 11 Apr. 1959, 1 ♀; 13 Apr. 1959, 1 ♀; 19 Apr. 1959, 2 ♀♀; 20 Apr. 1959, 2 ♀♀; 22 Apr. 1959, 1 ♂; 24 Apr. 1959, 2 ♀♀; 4 May 1959, 3 ♀♀; 9 Dec. 1959, 3 ♀♀; 11 Dec. 1959, 1 ♀, 1 ♂ (E. Tindall). Florschutz and Darsie (1960) listed records from *Microtus pennsylvanicus* (Ord) and *P. leucopus.*

Hirstionyssus carnifex (Koch).—Newark, New Castle Co., ex *B. b. talpoides,* 12 Apr. 1959, 2 ♀♀; ex *P. l. noveboracensis,* 13 Apr. 1959, 2 ♀♀ (E. Tindall). Baker et al (1956) stated that this mite has been reported as a parasite from bats and rodents in the United States, Europe, Africa and Asia. This is the first record from Delaware.

Resinacarus spp.—Newark, New Castle Co., ex *P. l. noveboracensis,* 13 Apr. 1959, 1; 19 Apr. 1959, 1; ex *B. b. talpoides,* 10 Nov. 1959, 1; (E. Tindall). Evans and Freeman (1950) noted some species of Tyroglyphinae were taken from fleas; their presence being a case of transportation rather than one of feeding on the fleas. Two of the three recoveries of *Resinacarus* in the present study were in association with the fleas *O. leucopus* and *D. blarinae.* Baker and Wharton (1952) briefly mentioned this genus in their discussion of Pyemotidae. Both Tyroglyphinae and Pyemotidae are free living families, often infesting grain. It is therefore quite possible that this mite is not an ectoparasite. They also stated that the genus is little known and apparently of no economic importance. It is a new record for Delaware.

Anoplura

Hoplopleura hesperomydis (Osborn).—Newark, New Castle Co., ex *P. l. noveboracensis,* 18 Mar. 1959, 1 ♀, 1 ♂; 6 Apr.

1959, 1 ♀, 1 ♂; 13 Apr. 1959, 6 ♀♀, 1 ♂, 2 nymphs; 13 Apr. 1959, 1 ♀; 19 Apr. 1959, 2 ♀♀, 1 ♂; 20 Apr. 1959, 1 ♀, 1 ♂; 21 Apr. 1959, 3 ♀♀, 1 ♂; 22 Apr. 1959, 1 ♂; 9 Dec. 1959, 1 nymph; 11 Dec. 1959, 8 ♀♀, 4 ♂♂, 8 nymphs (E. Tindall). MacCreary (1945a) found *Hoplopleura acanthopus* (Burmeister) parasitizing *P. leucopus* in Delaware, though Ferris (1951), listed only *H. hesperomydis* from this host. Race (1956) also recorded it from *P. leucopus* in New Jersey, as well as *B. brevicauda, M. pennsylvanicus* and *M. pinetorum.* Cook and Beer (1959) reported this species from *P. leucopus* and *Peromyscus maniculatus* (Wagner) in the west and midwest. This is a new parasite record for Delaware.

Siphonaptera

Doratopsylla blarinae C. Fox.—Brenford, Kent County, ex shrew, 23 Apr. 1939, 1 ♂ (D. MacCreary); Camden, Kent Co., ex shrew, July, 1939, 1 ♀ (R. Smith); Newark, New Castle County, ex *B. b. talpoides,* 6 Apr. 1959, 4 ♀♀; 12 Apr. 1959, 2 ♀♀, 5 ♂♂; 15 Apr. 1959, 2 ♀♀, 9 ♂♂; 28 Apr. 1959, 5♀♀, 3 ♂♂; 10 Nov. 1959, 2 ♂♂; ex *P. l. noveboracensis,* 8 Apr. 1959, 1 ♂; 20 Apr. 1959, 1 ♀ (E. Tindall). Fox (1940) recorded *D. blarinae* from *P. leucopus.* MacCreary (1945a) found it on *B. brevicauda* while Burbutis (1956) collected it from *B. brevicauda* and *Microtus pinetorum* (Le Conte). Geary (1959) listed it from a number of soricid shrew species in New York. *P. leucopus* is a new host record for this flea in Delaware.

Ctenophthalmus pseudagyrtes Baker.—Sandtown, Kent Co., ex Pine mouse, 17 May 1939, 1 ♀; Willow Grove, Kent Co., ex Pine mouse, Kent Co., 23 June 1939, 2 ♀♀, 2 ♂♂ (MacCreary); 27 June 1939, 1 ♀, 1 ♂; 3 Aug. 1939, 1 ♂. MacCreary (1945a) reported this species of flea taken from *B. brevicauda, M. p. pennsylvanicus, P. l. leucopus,* and *Sylvilagus floridanus malluras* (Thomas). Fox (1940) gave an extensive host list and noted that it was one of the most abundant of the flea parasites of small mammals. He also stated that it often occurs in company with *D. blarinae* as a parasite of shrews but that its favored host is probably the mole. Burbutis (1956) reported it for the first time from the Virginia opossum, *Didelphis marsupialis virginiana* Kerr.

Epitedia wenmanni (Rothschild).—Hockessin, New Castle Co., ex white-footed mouse, 29 Dec. 1939, 1 ♀; ex *M. pennsylvanicus,* 13 Feb. 1940, 1 ♂ (MacCreary); Newark, New Castle Co., ex *P. l. noveboracensis,* 18 Mar. 1959, 2 ♀♀; 19 Mar. 1959, 1 ♀; 26 Mar. 1959, 1 ♀, 1 ♂; 9 Apr. 1959, 1 ♀; 21 Apr. 1959, 2 ♀♀, 1 ♂;

11 Dec. 1959, 1 ♀ (E. Tindall). Fox (1940) stated that this flea seems to be pre-eminent on the white-footed mouse, but is also abundant on many small mammals and may be found in the adult stage during practically every month of the year. MacCreary (1945a) reported this flea from *P. leucopus.* Jameson and Brennan (1957) noted that *E. wenmanni* is typical of deer mice as well as microtine rodents and seems to be a spring flea. This appears to hold true for the Delaware collections. Burbutis (1956) found it on *P. leucopus, B. brevicauda, M. pennsylvanicus, M. pinetorum* and the "skunk." Geary (1959) also listed *Mustela erminea cicognanii* Bonaparte, *Peromyscus maniculatus gracilis* (Le Conte), *Clethrionomys gapperi gapperi* (Vigors), *Tamiasciurus hudsonicus loguax* (Bangs), the opossum, the cottontail, and the hairy-tailed mole as hosts of this flea.

Orchopeas leucopus (Baker).—Kent Co., ex pine mouse, 23 June 1939, 1 ♂; 21 July 1939, 2 ♀♀ (D. MacCreary); ex *P. l. noveboracensis,* 18 Mar. 1959, 2 ♀♀, 1 ♂; 19 Mar. 1959, 1 ♀; 20 Mar. 1959, 1 ♀; 26 Mar. 1959, 1 ♀; 9 Apr. 1959, 2 ♀♀; 13 Apr. 1959, 10 ♀♀, 3 ♂♂; 20 Apr. 1959, 1 ♀, 3 ♂♂; 21 Apr. 1959, 3 ♀♀, 1 ♂; 22 Apr. 1959, 1 ♀, 1 ♂; 24 Apr. 1959, 4 ♀♀, 1 ♂ (E. Tindall); ex Carolina wren nest, V–10–60, 1 ♀ (R. Collins). Fox (1940) gave the eastern hosts of this flea as *P. l. leucopus* (Rafinesque) and *M. pennsylvanicus.* Burbutis (1956) also listed *B. brevicauda* and *Mustela frenata noveboracensis* (Emmons) as hosts in New Jersey. Geary (1959) gave an extensive host list of mammals and noted 1 ♀ from a bluebird in New York State. It was reported as the dominant flea of *Peromyscus* in Eastern Canada by Holland (1949).

Orchopeas howardii howardii (Baker).—Faulkland, New Castle Co., ex red squirrel, 20 May 1951, 1 ♂; Newark, New Castle Co., ex red squirrel, 1 ♂ (D. MacCreary); Thompsonville, Kent Co., ex *S. c. pennsylvanicus,* 23 June 1959, 9 ♀♀, 5 ♂♂ (R. F. Darsie). MacCreary (1945a) reported this flea as *Orchopeas wickhami* Baker from the red squirrel. Burbutis (1956) noted the gray squirrel as its preferred host in New Jersey. He also found it to parasitize the opossum, *D. m. virginiana* Kerr, the raccoon, *Procyon lotor* (Linnaeus), and the red squirrel *T. hudsonicus.* Geary (1959) listed a variety of hosts for *O. h. howardii.* This, however, is the first time it has been recorded on the gray squirrel from Delaware.

Pulex irritans irritans Linnaeus.—Hartly, Kent Co., ex abandoned poultry house, 9 June 1960, 5 ♀♀, 3 ♂♂ (D. MacCreary).

Fox (1940) included a variety of hosts for this flea, but Geary (1959) reported it taken from man alone. Although it has been recorded from surrounding states, including nearby Oxford and Chadds Ford, Pennsylvania (Fox), this is the first record from Delaware.

Stenoponia americana Jordan.—Newark, New Castle Co., ex *P. l. noveboracensis,* 2 Mar. 1959, 1 ♀; 18 Mar. 1959, 3 ♀♀, 1 ♂; 20 Mar. 1959, 1 ♂; 13 Apr. 1959, 1 ♀ (E. Tindall). New Castle Co., ex *B. brevicauda,* April, 1939, 1 ♀; Hockessin, New Castle Co., ex *Peromyscus,* Nov. 1939, 1 ♂ (MacCreary). Fox (1940) gave as eastern hosts: *Evotomys* spp., *P. l. noveboracensis, M. p. pennsylvanicus,* "cotton-mouse," *Zapus hudsonius hudsonius* (Zimmerman) and the "Norway-rat." MacCreary (1945a) also reported it from *M. p. pennsylvanicus.* Burbutis (1956) found this flea to parasitize also *B. brevicauda* and *M. pinetorum.*

The association of ectoparasites with each other on the same host animal was determined for the 32 deer mice sampled; see

Table 2. Record of Association of Ectoparasites on the host *P. leucopus,* Delaware, 1959

Species	*B. simplex*	*Eu. peromysci*	*H. carnifex*	*Resinacarus* spp.	*H. glasgowi*	*H. hesperomydis*	*D. blarinae*	*E. wenmanni*	*O. leucopus*	*S. americana*
B. simplex	X*	1			1	1				
Eu. peromysci		5	1	1	12	11	2	5	10	3
H. carnifex			X		1	1			1	
Resinacarus spp.				X		1			1	
H. glasgowi					1	8		4	8	
H. hesperomydis						X	1	3	7	2
D. blarinae							X			
E. wenmanni								X	6	1
O. leucopus									1	2
S. americana										1

* "X" denotes that the parasite was never found occurring alone on the host.

Table 2. *Eu. peromysci* was the most abundant ectoparasite collected; occurring the greatest number of times in association with other species on the host. It was found alone a greater number of times than any other ectoparasite. *H. glasgowi, H. hesperomydis* and *O. leucopus* also appeared with other species in many instances. Of the fleas, *O. leucopus* and *E. wenmanni* were associated most often; however, the mice were much more heavily infested with the former.

LIST OF THE SIPHONAPTERA OF DELAWARE AND THEIR HOSTS

This is the initial listing of the fleas of Delaware and their hosts, and although it is not the result of an exhaustive study of the order it seems appropriate to consolidate the information which is on hand for the benefit of future workers in the group. To date 14 species of Siphonaptera have been taken from 13 hosts. All are from mammalian hosts, except *Ceratophyllus gallinae* (Schrank), the European chicken flea. Details of this species in Delaware were given by MacCreary and Catts (1954).

- *Cediopsylla simplex* (Baker)
  - *Marmota monax monax* (L), woodchuck
  - *Sylvilagus floridanus* (Allen), cottontail rabbit
- *Ceratophyllus gallinae* (Schrank)
  - *Gallus gallus* Linnaeus, chicken
- *Ctenocephalides canis* (Curtis)
  - *Canis familiarus* Linnaeus, dog
- *Ctenocephalides felis* (Bouché)
  - *Homo sapians* Linnaeus, man
- *Ctenophthalmus pseudagyrtes* Baker
  - *Blarina brevicauda* (Say), short-tailed shrew
  - *Microtus p. pennsylvanicus* (Ord), meadow vole
  - *Microtus p. pinetorum* (Lec), Pine vole
  - *Peromyscus l. leucopus* (Raf), white-footed mouse
  - *Sylvilagus floridanus* (Allen)
- *Doratopsylla blarinae* C. Fox
  - *Blarina brevicauda* (Say)
  - *Peromyscus l. leucopus* (Raf.)
- *Epitedia wenmanni* (Rothschild)
  - *Peromyscus l. leucopus* (Raf.)
- *Megabothris asio asio* (Baker)
  - *Microtus p. pennsylvanicus* (Ord.)
- *Odontopsylla multispinosus* Baker

  Sylvilagus floridanus (Allen)
  Didelphis virginiana Kerr, opossum
Orchopeas howardii howardii (Baker)
  Tamiasciurus hudsonicus loquax (Bangs), red squirrel
  Sciurus carolinensis pennsylvanicus Ord., gray squirrel
Orchopeas leucopus (Baker)
  Microtus p. pinetorum (Lec.)
  Peromyscus l. leucopus (Raf.)
Oropsylla arctomys (Baker)
  Vulpes fulva fulva Desmarest, red fox
  Marmota monax monax (L.)
Pulex irritans irritans Linnaeus
  Abandoned poultry house
Stenoponia americana (Baker)
  Microtus p. pennsylvanicus (Ord.)
  Microtus p. pinetorum (Lec.)
  Peromyscus l. leucopus (Raf.)

Summary

As a result of this study, seven new ectoparasitic species records and three new host records have been added to those already reported for Delaware. In addition a Siphonaptera host list has been compiled for the species of fleas known to occur within the State. The following species of ectoparasites are new records for the State: *Blarinobia simplex* (Ewing), *Euschongastia blarinae* (Ewing), *Euschongastia peromysci* (Ewing), *Hirstionyssus carnifex* (Koch), *Resinacarus* spp., *Hoplopleura hesperomydis* (Osborn), *Pulex irritans irritans* Linnaeus.

In the spring and fall of 1959, small mammals were trapped from a hardwood forest in Newark, New Castle Co., and examined for ectoparasites. Thirty-nine hosts and an abandoned poultry house yielded a total of 773 ectoparasites. Species association, host-parasite relationship, and literature citations to more detailed accounts accompany each record.

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A GYNANDROMORPHIC CRAB SPIDER

By J. F. Anderson[1]

The majority of American gynandromorphic spiders have been described by Exline (1938). Kaston, (in press), discusses other cases of gynandromorphism as well as other types of interesting anomalies which occur in spiders.

The description which follows concerns a gynandromorphic *Xysticus transversatus* (Walckenaer), which was collected by the author while sweeping a grassy field in Wethersfield, Connecticut on May 22, 1960. The asymmetry of the abdomen led to further examination. It was noted that the palp on what later proved to be the male side was missing. The specimen was determined by Dr. B. J. Kaston, Central Connecticut State College, to whom the author wishes to express his gratitude and appreciation for the guidance and help given in this study.

Color: The thoracic portion of the median band on the carapace is tan colored on the left side (male) while on the right side (female), the color is cream. The lighter areas running medial to the thoracic margins of the carapace are likewise tan and cream respectively. The legs of the left side are colored like the legs of a normal male, an orange brown, and those of the right side are colored like the legs of a normal female, a dull yellow with brown spots. The right side of the dorsum of the abdomen shows three light brown areas separated by two transverse bars of a creamy white color, whereas the left side has three dark orange brown areas separated by two distinctly white transverse bars. This difference is similar to the situation reported by Balogh (1936) in his gynandromorphic salticid, *Philaeus chrysops* (Poda). The ventral surface of the abdomen is uniformly cream colored with numerous brown spots present. The spots of the left side are a slightly darker brown than those of the right side. There is no difference in the coloration of the sternum, labium and endites.

Eyes: The eyes do not show any differences with respect to their size or the spacing between them. Gertsch (1939) reports that in the female, the median eyes of both rows are separated by three diameters, and in the male, they are separated by only two diameters. In the gynandromorph under discussion, the median eyes of both rows are separated by three diameters.

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Chelicerae: The chelicerae are dissimilar with respect to size and spination. The one on the left side is thinner and shorter than that of the right side. This type of difference was also found by Balogh in his gynandromorphic salticid. In addition, thirteen small to medium sized erect spines arise from the promarginal face of the right chelicera, and only one medium sized spine and two small ones appear on the corresponding face of the left chelicera. From examination of the normal male and female, the extent of spination of the promarginal faces of the chelicerae appears to be dependent on sex. The other mouthparts show no differences.

Legs: The leg sizes are shown below with all measurements in millimeters.

Right	Femur	Pat-tibia	Metatarsus	Tarsus	Total
I	2.21	2.97	1.63	.86	7.67
II	2.40	2.78	1.63	.77	7.58
III	1.63	1.92	.86	.77	5.18
IV	1.73	1.92	.96	.77	5.38

Left	Femur	Pat-tibia	Metatarsus	Tarsus	Total
I	2.69	3.36	2.01	missing	. . .
II	2.78	3.17	2.11	1.15	9.21
III	1.82	1.92	1.15	.67	5.56
IV	1.92	1.92	1.15	.86	5.85

As can be seen, the legs on the left side are consistently longer than the legs of the right side. The legs show another set of differences and that is spination. Gertsch (1939) reports the spination of the first leg of the male and female. The gynandromorph agrees with this description, with the first left leg characteristically male and the first right leg characteristically female. The spines on the female side are also slightly shorter and thicker than those of the male side.

Abdomen: In normal specimens, the length of the abdomen in the female is about 1.4 times as much as that of the male and the width is about 1.2 times as much. The abdomen in the gynandromorph exhibits an enlarged right side which in turn leads to a twisting effect so that the spinnerets are located on the left side of it and are pointing about 20 degrees to the left of center (Fig. 1).

Spinnerets: The spinnerets, especially the posterior and anterior pairs, show differences in size which can be seen from the measurements given here in millimeters.

	Left		Right	
	Length	Width at Base	Length	Width at Base
Anterior	.35	.20	.50	.30
Posterior	.25	.10	.35	.15

Epigynum: Examination of the epigynal area shows development of the epigynum only on the right side, a situation which is similar to that reported by Hackman (1951) in his gynandromorphic erigonid *Troxochrus scabriculus* (Westring). The median septum is slightly rotated clockwise due to the torsion of the abdomen (Compare Figs. 2 and 3).

Palps: The right palp is present and appears normal for a female. Although the palp on the left side is missing, it can be surmised from the other characteristics that this spider is a bilateral gynandromorph, and that the missing palp is a male one.

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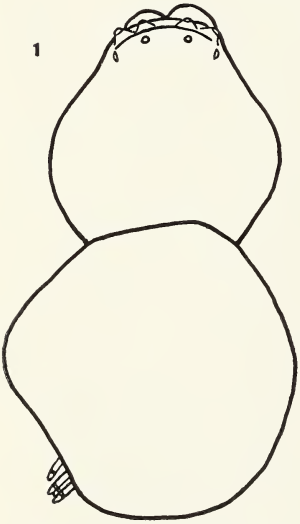

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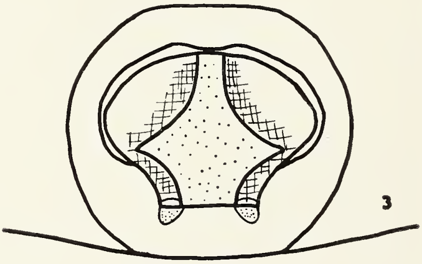

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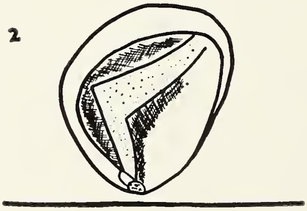

Fig. 1, Dorsal view of gynandromorph *Xysticus transversatus* (Walckenaer). Fig. 2, Epigynum of same. Fig. 3, Epigynum of normal specimen.

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THREE NEW SPECIES OF PSILOCORSIS CLEMENS (LEPIDOPTERA: OECOPHORIDAE) FROM SOUTHERN ARIZONA

By Ronald W. Hodges[1]

John G. Franclemont and I collected Lepidoptera in southeastern Arizona from June 29 through November 11, 1959. Most of the collecting was done in Madera Canyon, a north-facing canyon, in the Santa Rita Mountains, Santa Cruz County. Most of the material was taken at an elevation of 4880 feet in the chaparral zone which is intermediate in character between the desert grassland zone below and the pine zone above. Distinctive trees and shrubs of the chaparral zone are scrub oaks (*Quercus* spp.), sumacs (*Rhus* spp.), manzanitas (*Arctostaphylos* spp.), sycamores (*Platanus* spp.), catclaw (*Acacia greggii*), and junipers (*Juniperus* spp.). A wide variety of herbaceous plants appears during and after the rainy periods. As a result of the variety of plants present and the lack of a pure stand of any one species, there is a larger number of species of Lepidoptera present in this zone than in either of the adjacent ones. Another factor which augments the number of species of Lepidoptera found in the area is that during a rainy summer, when the streams are flowing, there is a tendency for moths to use the cuts of the major waterways as flyways. Therefore, many species of moths from the pine and grassland zones may be found in the intermediate one.

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The summer rains, which began on June 29 in 1959 and continued through September, were much heavier than normal, with a resulting "greening up" of the canyon. Concomitant with the above-average rainfall was a larger number of moths as contrasted with the number present during the summer of 1960 when the rains were below normal (*Teste* J. G. Franclemont).

Approximately 35,000 moths were collected and spread during the 1959 season; of these about 15,000 were Microlepidoptera, with the Gelechiidae and Blastobasidae predominating. I am gradually working up the Gelechioidea, and the material will be divided between the Cornell University Collection and my collection, with the types of new species being placed in the former.

The two species of *Psilocorsis* which we collected appear to be undescribed. Also, Lloyd Martin of the Los Angeles County Museum has allowed me to describe a third species of *Psilocorsis* which he had collected in the Chiricahua Mountains.

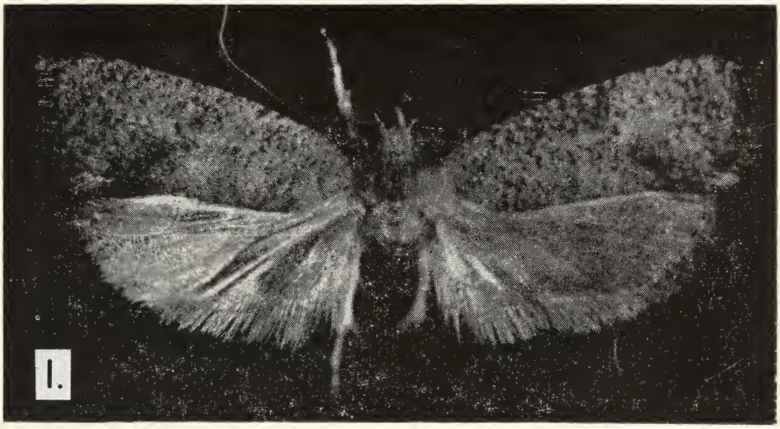
Psilocorsis amydra, n. sp.

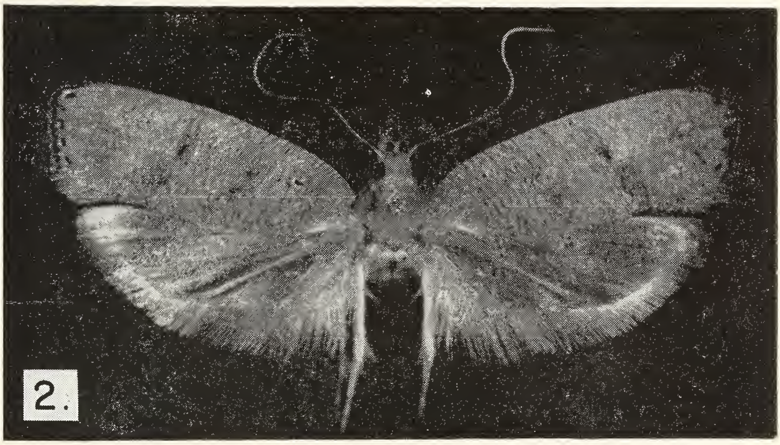
Head dark tan. Labial palpi: second segment light buff on inner surface, a row of black scales on ventral surface, followed outwardly by a row of buff ones, a row of dark (almost black) scales, then a series of tan scales on outer surface; third segment with alternating rows of black and buff scales: black ventrally and laterally, buff dorsally and at ventro-lateral angles; apex buff. Antennae buff on outer surface, black on inner surface, a row of buff scales on scape, and two rows of buff scales on shaft; apex of shaft tan. Thorax fuscous-brown. Forewings (Fig. 1) fuscous-brown with an overlay of blackish scales; a black spot at one-third and another at two-thirds of distance from base to apex on costal margin of discal cell; a fuscous streak from outer edge of disal cell to tornus; and a row of black dots, tending to become linear, along outer margin from apex to dorsal margin beyond tornus. Hindwings fuscous; cilia fuscous at apex, lighter elsewhere. Legs: buff; prothoracic pair with anterior surface of tibiae dark fuscous-brown, anterior

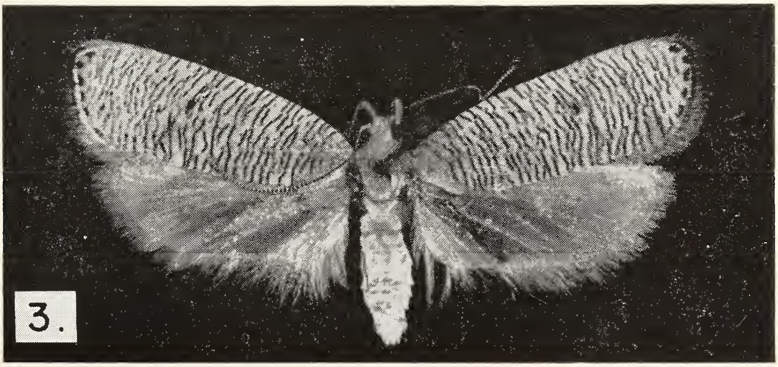
Explanation of Plate I

Fig. 1, *Psilocorsis amydra* Hodges, n. sp., type, Madera Canyon, Santa Cruz Co., Arizona. Fig. 2, *P. arguta* Hodges, n. sp., type, Madera Canyon, Santa Cruz Co., Arizona. Fig. 3, *P. cirrhoptera* Hodges, n. sp., Chiricahua Mountains, Arizona.

HODGES PLATE I


1.


2.


3.

surface of first two tarsal segments brown, anterior surface of last three tarsal segments dark fuscous, and last row of scales on fifth tarsal segment buff; mesothoracic pair with same color pattern except that colors are lighter; mesothoracic pair buff with outer tibial spurs fuscous, inner ones buff.

Male genitalia: (Figs. 4 and 4a) R.W.H. slide no. 639.

Female genitalia: (Fig. 7) R. W. H. slide no. 640. Signum with 23 to 27 branches.

Alar expanse: 18–24 mm.

Types: Holotype: female, Madera Canyon, 4880 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, August 6, 1959 (R. W. Hodges), [CU Type No. 3731]. Paratypes: 6 males, 19 females, Madera Canyon, 4880 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, July 9 through August 26, 1959 (R. W. Hodges); one female, Madera Canyon, 5600 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, August 1, 1959 (R. W. Hodges); 5 females, Madera Canyon, 5800 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, July 12 through August 1, 1960 (J. G. Franclemont).

Psilocorsis amydra can be separated from *P. faginella* (Chamb.) by the dark tan head contrasting with the fuscous-brown thorax in *amydra,* whereas the head and thorax of *faginella* are concolorous. The male genitalia of *amydra* have a patch of cornuti along the medial section of the vesica, none at the terminal portion of the vesica as compared with *faginella* which has a terminal cornutus and a medial group of cornuti. The ventro-lateral patches of setae on the genital plate of the female of *amydra* are composed of 15–20 setae, contrasted with five in each patch in *faginella.*

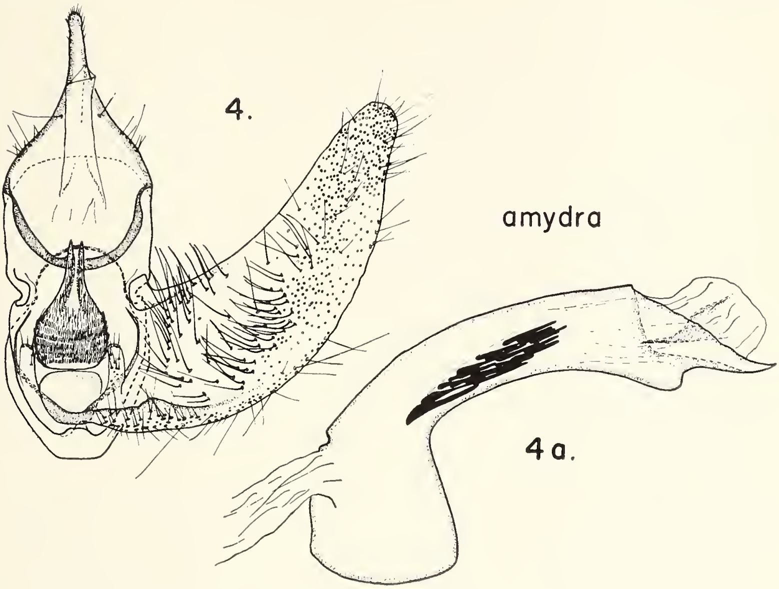
Psilocorsis arguta, n. sp.

Head and antennae yellow-brown with same color pattern as *P. amydra.* Thorax brown. Forewings (Fig. 2) brown, with several transverse rows of fuscous-brown scales, and a series of terminal black dots from apex to tornus; cilia shining dark fuscous, composed of two scale rows. Hindwings fuscous, with some veins outlined with darker scales; cilia fuscous, darker at apex. Legs

EXPLANATION OF PLATE II

Figs. 4–6, *Psilocorsis,* ventral view of male genitalia. The scale of drawing of the aedeagi is twice that of the genitalia. Fig. 4, *P. amydra* Hodges, n. sp. Fig. 5, *P. cirrhoptera* Hodges, n. sp. Fig. 6, *P. arguta Hodges,* n. sp.

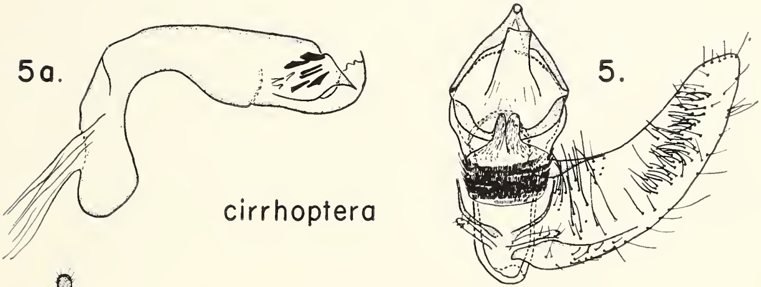
HODGES PLATE II



4.

amydra

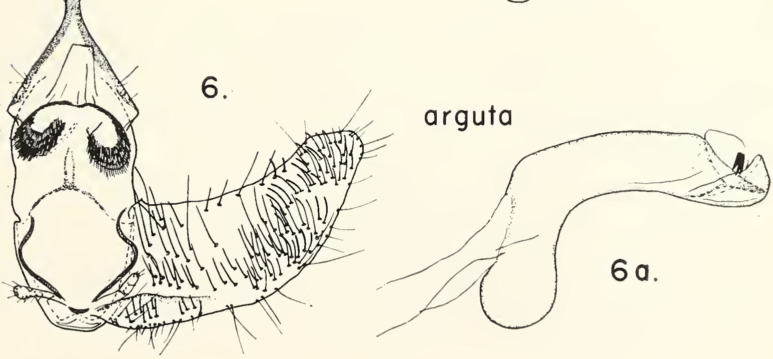
4a.



5a.

5.

cirrhoptera



6.

arguta

6a.

buff; last three tarsal segments of prothoracic legs fuscous-brown on anterior surface.

Male genitalia: (Figs. 6 and 6a) R.W.H. slide no. 641. The uncus is partially curved in this preparation; thus, it appears foreshortened. Also, the gnathos is tilted, giving the appearance of difference; however, it is nearly the same in outline as the gnathos of *amydra*.

Female genitalia: (Fig. 9) R.W.H. slide no. 642. Signum with 25 to 28 branches.

Alar expanse: 18–22 mm.

Types: Holotype: female, Madera Canyon, 5600 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, August 1, 1959 (R. W. Hodges), [CU Type No. 3730]. Paratypes: 11 males, 16 females, Madera Canyon, 5600 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, August 1 through September 24, 1959; 11 males, 1 female, Madera Canyon, 4880 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, July 6 through August 23, 1959.

Psilocorsis arguta can be separated from *P. faginella* by its slightly yellow-brown forewings; those of *faginella* lack the yellowish tone. The transverse markings of the forewings of *arguta* are narrow and distinct; in *faginella* these markings are wider and indistinct, often covering most of the forewing. The male genitalia have three, small terminal cornuti in *arguta* as contrasted with one, stout terminal cornutus and a series of short, slender cornuti along the medial portion of the vesica of *faginella*. The female genitalia of *arguta* have the portion of the genital plate anterior to the ostium not sharply set off from the posterior portion of the genital plate, whereas this area is well defined in *faginella;* and there are 15–20 setae in each ventro-lateral setal patch on the genital plate of *arguta,* contrasted with 5 setae in each patch on the genital plate of *faginella.*

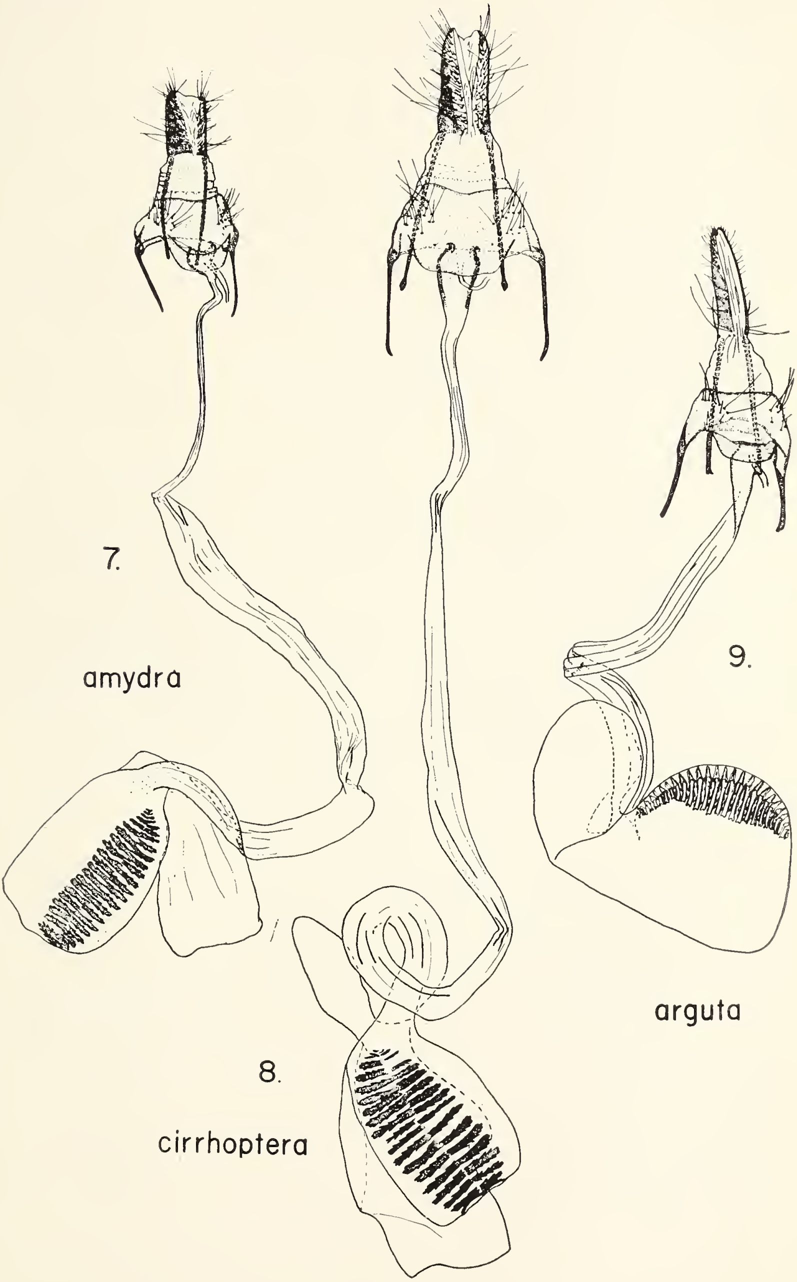
Psilocorsis cirrhoptera, n. sp.

Head, thorax, wings, abdomen, and legs buff. Labial palpi with a ventral black line on second segment (stronger distally), and three black lines on third segment: one on ventral, inner and outer

EXPLANATION OF PLATE III

Figs. 7–9, *Psilocorsis,* ventral view of female genitalia. The scale of *P. cirrhoptera* is twice that of the other species. Fig. 7, *P. amydra* Hodges, n. sp. Fig. 8, *P. cirrhoptera* Hodges, n. sp. Fig. 9, *P. arguta* Hodges, n. sp.

HODGES PLATE III



7.

amydra

8.

cirrhoptera

9.

arguta

surfaces; apex buff. Antennae: inner surface of scape with two black lines separated by a whitish one, buff on outer surface; inner surface of shaft with a continuation of black and buff scales, outer surface buff. Legs with distal tarsal segments fuscous on anterior surface. Forewings (Fig. 3) with a series of black scale rows; a black dot on outer margin of discal cell; a row of terminal black dots from apex to tornus; cilia of two scale rows, inner one fuscous from apex to tornus, outer one light fuscous basally, darker distally, both rows becoming buff at tornus. Hindwings buff.

Male genitalia: (Figs. 5 and 5a) R.W.H. slide no. 728. The uncus is curved in the preparation; thus, it appears foreshortened.

Female genitalia: (Fig. 8) R.W.H. slide no. 645. Signum with 19 branches.

Alar expanse: 18–21 mm.

Types: Holotype: female, Upper Camp, Pinery Canyon, Chiricahua Mountains, Cochise Co., Arizona, July 4, 1956 (Lloyd M. Martin, John A. Comstock, William A. Rees), [Los Angeles County Museum]. Paratypes: 11 males, 11 females, Upper Camp, Pinery Canyon, Chiricahua Mountains, Cochise Co., Arizona, July 3–6, 1956 (Lloyd M. Martin, John A. Comstock, William A. Rees); one male, Upper Camp, Pinery Canyon, Chiricahua Mountains, Cochise Co., Arizona, June 27, 1955 (Lloyd Martin).

Psilocorsis cirrhoptera can be separated from *P. faginella* by the former being light buff in color; *faginella* is brown. The transverse markings on the forewings of *cirrhoptera* are narrow and sharp, whereas those of *faginella* tend to be wide and indistinct. The male genitalia of *cirrhoptera* lack a medial patch of cornuti but have a terminal patch of them; contrasted with those of *faginella* which have a medial patch of cornuti and a single terminal one in the vesica.

The males of the new species can be separated from one another by the male genitalia: *amydra* has a medial patch of cornuti in the vesica (Fig. 4a); *cirrhoptera* has six or seven terminal cornuti but lacks the medial ones (Fig. 5a); and *arguta* has two or three terminal cornuti but lacks the medial patch. The females can be separated as follows: *arguta* has the ductus bursae less than three times as long as the signum; the ductus bursae of *amydra* and *cirrhoptera* is more than three times the length of the signum; in *amydra* the portion of the genital plate anterior to the ostium is sharply set off from the rest of the genital plate; and in *cirrhoptera* the portion of the genital plate anterior to the ostium is not sharply set off from the rest of the genital plate.

Key to the Species of Psilocorsis based primarily on Coloration[2]

1. Forewings with a broad, dark transverse fascia at
outer two-thirds .... *obsoletella* (Zeller)
Forewings without such a fascia 2
2. Forewings with distinct purplish luster; species
dark colored 3
Forewings without purplish luster, or if this is present, it is
only faintly indicated 4
3. Alar expanse 19 mm. .... *fletcherella* Gibson
Altar expanse 18 mm. or less .... *caryae* Clarke
4. Alar expanse 18 mm. or more 5
Alar expanse 16 mm. or less .... *quercicella* Clemens
5. Forewings with dark markings confined to outer discal spot
and a few spots around termen
faginella (Chambers) (part)
Forewings otherwise 6
6. Thorax much darker than head 7
Thorax and head nearly concolorous 8
7. Forewings ochreous, overlaid with reddish fuscous
reflexella Clemens
Forewings fuscous-brown .... *amydra,* n. sp.
8. Forewings light buff .... *cirrhoptera,* n. sp.
Forewings yellow-brown or brown 9
9. Forewings yellow-brown .... *arguta,* n. sp.
Forewings brown .... *faginella* (Chambers) (part)

Paratypes of the three species, as they are available, will be deposited in the following collections: Cornell University, Los Angeles Co. Museum, United States National Museum, Canadian National Collection, British Museum of Natural History, California Academy of Sciences, J. G. Franclemont, and my personal collection.

Grateful acknowledgment is made to the Grace H. Griswold Fund of the Department of Entomology of Cornell University for assuming the expense of engraving the plates.

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[2] Adapted from Clarke, Proc. U.S. Natl. Mus. 90, no. 3107, 1941.

THE GENUS HODOPHYLAX JAMES (DIPTERA: ASILIDAE)

By Joseph Wilcox[1]

The genus *Hodophylax* James was erected in 1933 for the species *aridus,* from Colorado. Pritchard in 1938 described *basingeri* from a female specimen from California. In this paper two species are described as new, the male of *basingeri* is described, and a key to the species is given. All references to the genus are given under *aridus.*[2]

Hodophylax belongs in the subfamily Dasypogoninae and to the group with a twisted spine at the apex of the fore tibiae. With the pulvilli lacking or atrophied, it can only be confused with *Omniablautus* Pritchard or *Parataracticus* Cole. These genera have the mystax extending to the antennae (composed of sparse bristles in *Parataracticus* and dense hairs in *Omniablautus*), and both have strong dorsocentral and scutellar bristles. In *Hodophylax* the mystax is confined to the lower half of the face, the dorsocentral bristles can hardly be distinguished from the hairs, and the scutellar bristles are weak.

Key to the Species

1. Scutellum wholly pollinose; style two-thirds length of third antennal segment; tibiae and tarsi black; face at antennae three-fourths width of one eye 2

   Scutellum laterally bare of pollen; style not more than one-half length of third antennal segment; tibiae and tarsi dorsally reddish; face at antennae two-thirds width of one eye . . 3

2. Lower one-fourth of face bare of pollen; hairs of mystax laterally extending one-third distance of antennae; pollinose fasciae on abdominal segments 2–4 entire or nearly so and 2–5 with a central vertical pollinose stripe or spot; mesonotal hairs sparse, appressed and not larger than first antennal segment; length 9–10 mm. (Calif.) . . . . *halli*

   Face wholly pollinose; hairs of mystax extending one-half dis-

---

[1] 21171 Mohler Place, Anaheim, California.

[2] I am indebted to the following for the loan of specimens: Charles H. Martin, Oregon State College and including material from the University of Arizona and University of California (Davis); P. H. Timberlake, University of California (Riverside); and Willis W. Wirth, U. S. National Museum.

tance to antennae; pollinose fasciae interrupted on all abdominal segments; mesonotal hairs semierect and as long or longer than the first two antennal segments; length 5–9 mm. (Calif., Ariz.) .... *basingeri*

3. Scutellum narrowly bare of pollen at sides: female abdominal segments 2–4 with entire pollinose fasciae leaving a bare spot on either side anteriorly and a rounded spot at the middle posteriorly, male segments 2–3 similar but segments 4–5 wholly pollinose; length 7 mm. (Colo., Ariz., Kans., N. M., Texas) .... *aridus*

Scutellum broadly bare of pollen laterally; pollinose fasciae of both sexes broadly interrupted on abdominal segments 1–5; length 6–8 mm. (Ariz., N. Mex.) .... *tolandi*

Hodophylax aridus James

Hodophylax aridus James, 1933, Amer. Mus. Novitates 596: 1–2.
Ablautus mcgregori Bromley, 1934, Ann. Ent. Soc. America 27 (1): 88. (*New Synonymy*)
Hodophylax aridus James, 1934, Pan-Pac. Ent. 10 (2.: 83–84.
Hodophylax aridus, Pritchard, 1938, Pan-Pac. Ent. 14 (3): 129–130.

Originally described from a single female from Crowley, Colo., 1 Sept. 1932 (M. T. James). *Ablautus mcgregori* was described from a single male from Uvalde Co., Texas, 12 Sept. 1932 (S. E. McGregor). The late S. W. Bromley recognized *mcgregori* as a synonymn of *aridus* but there appears to be no previous published record. James described the allotype male from Boone, Colo., 5000′, 17 Aug. 1928 (R. H. Painter) and recorded specimens from Hamilton Co., Kans., 4000′, 6 Aug. 1928 (Painter). Pritchard reported specimens from Artesia, N. M., 30 Aug. 1934 (A. E. Pritchard), and Willcox, Ariz., 30 Aug. 1934 (T. F. Winburn and Painter).

Specimens have been seen from the following additional localities: Hidalgo Co., Texas, 13 Sept. 1933 (S. W. Bromley); Willcox, Ariz., Cochise Co., 18 and 20 Aug. 1958 (R. M. Bohart, G. B. Pitman, D. D. Linsdale); Wenden, Ariz., Yuma Co., 13 Sept. 1954 and Picacho Pass, Pima Co., 13 Sept. 1954 (J. C. Hall).

Hodophylax basingeri Pritchard

Hodophylax basingeri Pritchard, 1938, Pan-Pac. Ent. 14 (3): 130–131.

Described from a single female specimen from Quail Spring, San Bernardino Co., Cal., 5 Oct. 1934 (A. J. Basinger), in the Basinger Collection.

Male: Length 7 mm. Very similar to female. Six or 7 hairs on either side of the scutellum apically. Pollinose spots on the abdomen confined to the posterior corners of segments 1–5 and lateral margins of segments 2–4 but not following the posterior margin toward the middle as in the female. Small genitalia brown. Halteres yellowish. Wing veins brownish to yellowish, anterior crossvein beyond middle of discal cell.

Hypotype: Male, Twentynine Palms, San Bernardino Co., Cal. 17 Sept. 1948 (J. Wilcox); in the Wilcox Collection.

Other specimens seen or taken in the following localities: ARIZONA: Ehrenberg, 22 Oct. 1956 (M. W. Stone and Wilcox); 25 mi. E. Gila Bend, 30 Sept. 1955 (G. D. Butler). CALIFORNIA: Indio, 17 Sept. 1947 (A. F. Howland and Wilcox); Julian, San Diego Co., 18 Sept. 1938 (W. N. Burdick); White Water (Palm Springs R.R. Station), 17 Sept. 1948, 10 Nov. 1942, 11 Nov. 1941 (Wilcox); 7, 10 and 10.5 mi. W. Blythe, 2 Oct. 1954 (P. H. Timberlake, J. C. Hall).

Hodophylax tolandi, n. sp.

Male: Length 6 mm. Head black, gray pollinose, hairs and bristles white or yellowish. Mystax short, confined to the oral margin but with short white hairs above on face. Antennae black, the second segment yellowish red; first two segments and style subequal in length, the third 1½ times the length of the first two segments.

Mesonotum brown and black, gray pollinose, the central stripe and intermediate area brown. Short recumbent hairs white, bristles white, 2–3 presutural, 3 supraalar and 2 postalar, about 7 dorsocentrals but hardly distinguishable from the hairs. Pleurae shining black, propleurae, mesopleurae above, sternopleurae behind and postscutellum densely gray pollinose; hypopleural fringe white. Scutellum brown, the margin black, short white haired and with two pair of white marginal bristles.

Abdomen dark brown becoming lighter apically, short sparse hairs white and with 3–4 white lateral bristles on first segment. Sides of segments 1–5 gray pollinose, slightly following the posterior margin toward the middle on segments 3–4. Genitalia brown.

Legs reddish brown, tip of femora and venter of tibiae black; hairs and bristles white except bristles at tip of tibiae and below on tarsi black; claws black, empodium yellowish white.

Halteres brown; alulae brown, margin and fringe white. Wings hyaline, basal cells with a tinge of brown, veins light to dark brown. Posterior and anal cells open, anterior crossvein at the middle of the discal cell.

Female: length 8 mm. Very Similar. Abdominal segments 1–3 and 6–7 and apical spines dark brown, segments 4–5 light brown.

Holotype: Male, Shumway, Arizona, 30 Aug. 1947 (J. Wilcox), Cal. Acad. Sci.

Allotype: Female, same data (Guy F. Toland), C.A.S.

Paratypes 6 ♂♂, 4 ♀♀, type locality, 1 Sept. 1959 (Wilcox); 1 ♀, 18 mi. N. Rodeo, N. M., Hidalgo Co., 25 Aug. 1958 (D. D. Linsdale), University of California, Davis.

Hodophylax halli, n. sp.

Male: Length 9 mm. Head black, lower face, cheeks, palpi and proboscis shining; otherwise densely silvery white pollinose. Hairs and bristles white: mystax composed of bristles on oral margin and hairs on either side extending one-third distance to antennae; frons with dense proclinate hairs; ocellar tubercle with sparse erect hairs and about 10 bristles. Face at antennae slightly less and the frons at the vertex slightly more than the width of one eye. First two antennal segments brownish and gray pollinose with white hairs (one strong bristle below on second antennal segment in other specimens), subequal in length, the first narrower than the second; the third and style black, the third 1½ times length of first two, the style two-thirds the length of the third.

Mesonotum black, the humeri and postalar callosities brown; densely white pollinose, the bisected central stripe and the intermediate area brown. Hairs and bristles white, sparse appressed hairs subequal in length to the first antennal segment; 2–3 posthumerals, 3 presuturals, 2 supraalars, 3 postalars, and about 3 weak posterior dorsocentrals. Pleurae and coxae densely white pollinose, with a diagonal bare black area extending from the sternopleurae to the pteropleurae; hairs white. Scutellum yellowish gray pollinose with 3 weak marginal bristles on either side.

Abdomen black, brown posteriorly on the apical segments; sides of segments 1–6 gray pollinose becoming broader apically, the narrow anterior margin of 2 and the posterior margin of 2–5 interrupted at the middle but with a dorsal vertical pollinose line on 2–5 and a round central spot on 6. Short sparse hairs white, bristles white about 6 on each side of first segment. Genitalia brown, white haired. Venter white pollinose.

Legs black, the basal five-sixths of the femora yellowish red.

Hairs white, rather dense appressed on tibiae and tarsi; bristles white, those below on the tarsi largely black; claws black; empodia short, white.

Halteres yellowish, lower stem brown; alulae yellowish, margin white. Wings hyaline, veins brown, anterior crossvein at four-sevenths the length of the discal cell, anal cell narrowly open, fourth posterior cell slightly narrowed.

Female: Length 9 mm. Similar to male. Five marginal hairs on either side of scutellum. Sides of abdominal segments 1–5 pollinose, on segments 2–4 the pollen follows the posterior margin to near the middle and on segment 4 connects with the central spot, central spots more rounded than in male and present on segments 2, 3 and 5; apical spines black.

Holotype: Male, Walker Pass, Kern Co., Calif., 21 Sept. 1957 (H. R. Moffitt), University of California (Davis).

Allotype: Female, same locality, 22 Sept. 1957 (J. C. Hall), University of Calif. (Davis).

Paratypes: 7 ♂♂, 33 ♀♀, same data and collectors and (E. I. Schlinger); 1 ♀, 11 mi. S. Adelanto, Calif., 25 Sept. 1959 (Wilcox).

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. LVI DECEMBER, 1961 No. 5

A NEW SPECIES OF *LIMNOGONUS* FROM AUSTRALIA (HEMIPTERA: GERRIDAE)[1]

By Herbert B. Hungerford and Ryuichi Matsuda

Limnogonus windi, n. sp.

(Plate I, figs. A, B; Plate II, a to e)

Size: Length of wingless male 5.25 to 5.50 mm.; width across head 1.30 to 1.36 mm.; width across mesoacetabula 2.10 mm. Length of wingless female 6.85 mm.; width across head 1.50 mm.; width across mesoacetabula 2.69 mm.

Color: General facies cinnamon brown, only dark markings on head, anterior lobe of pronotum, metanotum and dorsal abdominal segments being dark brown to black. Pronotum bordered by a pale yellowish line, two reddish yellow lines on anterior lobe, median longitudinal pale line nearly effaced caudally, posterior lobe of pronotum and broad band on sides of mesothorax cinnamon brown, sometimes with a slender dark submarginal line below the margin of pronotum. Mesopleuron beneath the broad cinnamon brown band with a dark brown band, beneath which is a broad dark area completely hidden by a silvery pile of hairs. Venter yellowish white. Metanotum and abdominal tergites black with a median pale spot on some of tergites. Tergites and dorsal surfaces of second, third, and sometimes fourth abdominal segments covered by a silvery pile.

Structural characteristics: Relative lengths of antennal segments of a male, 1st : 2nd : 3rd : 4th :: 80 : 47 : 42 : 51[2]

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[1] Contribution No. 1102 from the Department of Entomology, University of Kansas. This report is a by-product of a project conducted with the aid of a grant from the National Science Foundation.

[2] 20 units are equal to 0.42 mm.

INSTITUTION JAN

TABLE 1. **Relative lengths of leg segments of a male**

	Femur	Tibia	First tarsal segment	Second tarsal segment	Total length of tarsus
Front leg	102	92	10	18	28
Middle leg	258	230	92	23	115
Hind leg	278	145	28	18	46

TABLE 2. **Relative lengths of leg segments of a female**

	Femur	Tibia	First tarsal segment	Second tarsal segment	Total length of tarsus
Front leg	125	110	11	25	36
Middle leg	325	300	108	24	132
Hind leg	330	180	30	17	47

Front femur in male broadest across basal third, nearly twice the diameter of its distal end, with a shallow longitudinal sulcus on its lower margin (Fig. 1, b). Front femur in female (Fig. 1, c) slightly broader at basal third than at apex and nearly straight. Anterior lobe of pronotum somewhat elevated but medially depressed to enclose two parallel pale spots. Lateral margin of pronotum concave behind anterior lobe, its caudal margin broadly rounded. Connexivum of female broad and reflexed over abdomen as shown in Plate 1, Fig. 2. Male ventral abdominal segments short, basal four segements being subequal to metasternum in length. Male genital segments (Fig. 1, d) not longer than abdominal venter. Abdomen of female plainly shorter than head and pronotum together, caudal margin of last ventral abdominal segment (Fig. 1, e) not medially produced.

Comparative notes: This species is near *L. cheesmani* Lundblad, from which it differs in not having the median projection on the ventral caudal margin of the first genital segment in male and on the ventral caudal margin of the seventh abdominal segment in female.

Types: Male wingless holotype, female wingless allotype and one male paratopotype bearing the labels "Australia, 8-12-38, R. G. Wind" and "N. Queensland, Barron River" are in the Francis Huntington Snow Museum, University of Kansas.

HUNGERFORD AND MATSUDA PLATE I

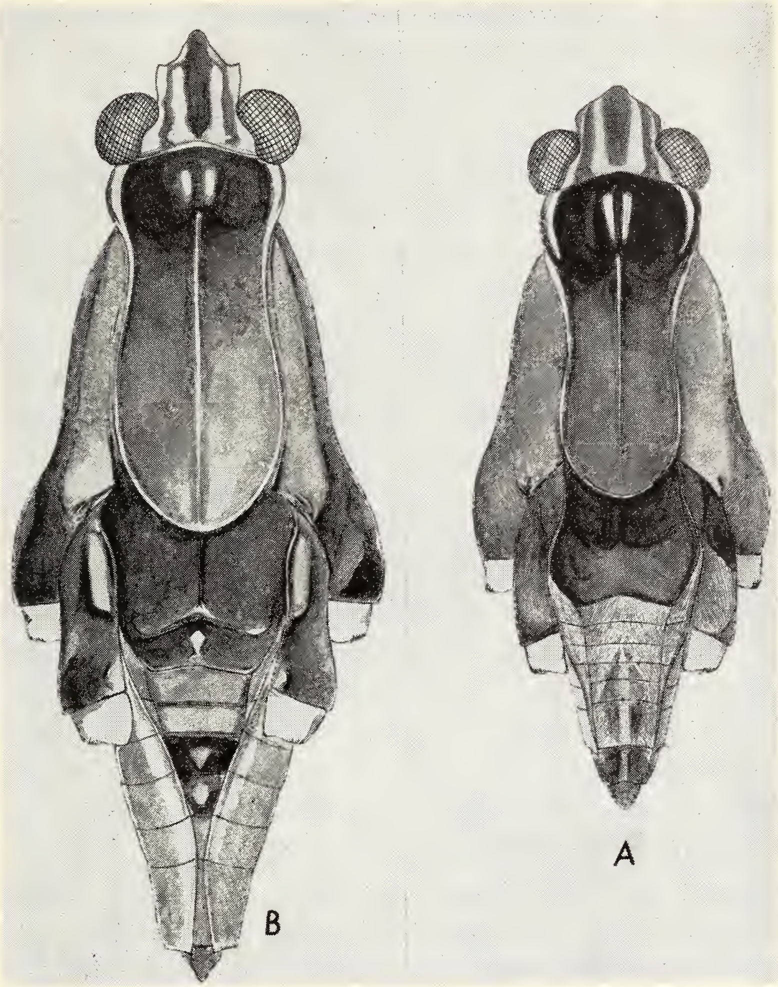

Plate I. *Limnogonus windi* Hungerford and Matsuda. Fig. A, Wingless male. Fig. B, Wingless female.

HUNGERFORD AND MATSUDA PLATE II

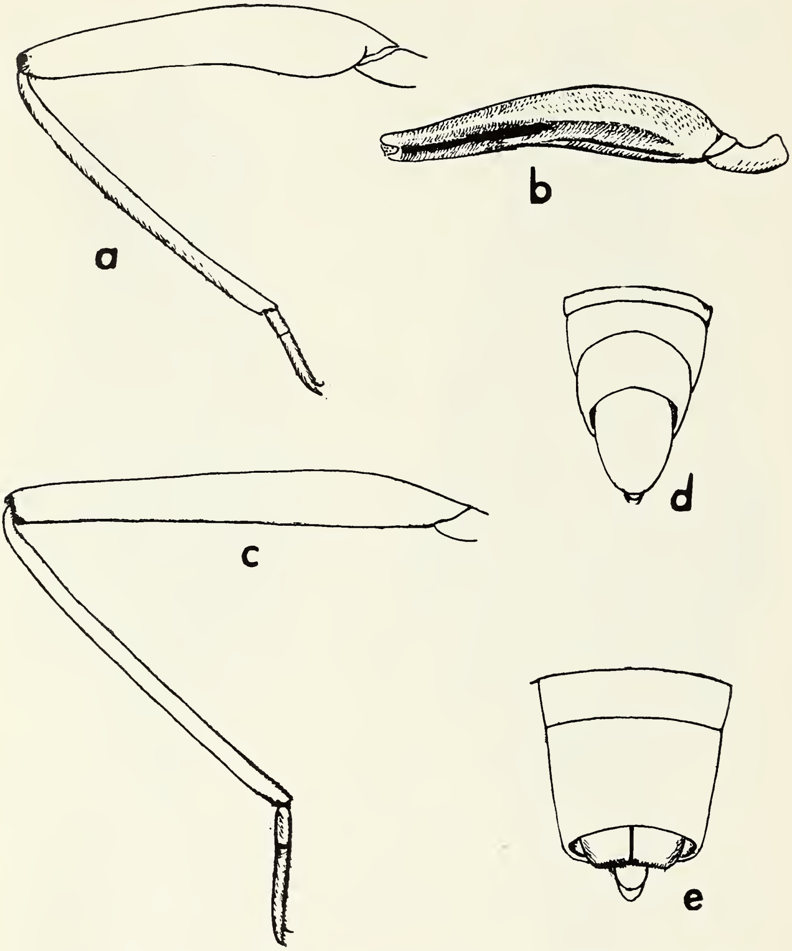

Plate II. *Limnogonus windi.* Fig. a, Side view of male front leg. Fig. b, Lower margin of male front femur. Fig. c, Side view of female front leg. Fig. d, Ventral view of male apical abdominal segments. Fig. e, Ventral view of female apical abdominal segments.

UNDESCRIBED SPECIES OF NEMATOCEROUS DIPTERA.

PART X.[1]

By Charles P. Alexander, Amherst, Mass.

The preceding part under this general title appeared in December 1960 (Bul. Brooklyn Ent. Soc. 55: 114–120). At this time I am describing further new species of Trichoceridae from the Himalayas where they were taken by Dr. Fernand Schmid, to whom I express my continued thanks for invaluable co-operation in making known the rich fauna of this area. One additional species of Blepharoceridae from southern Argentina was taken by Mr. Serge S. Schachovskoy, who has added materially to our knowledge of the fauna of southern South America.

TRICHOCERIDAE

Trichocera bellula, n.sp.

Size medium (wing of male 7–7.5 mm.); general coloration plumbeous; legs brownish black, femoral bases obscure yellow; wings tinged with yellow, the prearcular and costal regions clear light yellow, remainder of wing with transverse brown areas, more numerous in cell *1st A* and the outer radial field; abdomen brownish black; cerci elongate; male hypopygium with the dististyle simple, gonapophysis long and slender, the base relatively narrow.

Male: Length about 5–5.5 mm.; wing 7–7.5 mm.; antenna about 3.5 mm.

Female: Length about 5.5–6 mm.; wing 8–8.5 mm.; antenna about 3.7 mm.

Rostrum and palpi black. Antennae black, apex of pedicel paler, outer segments pale; first flagellar segment stout, about one-third longer than the second. Head plumbeous.

Thorax black, sparsely pruinose to appear dull plumbeous, praescutum with four faintly indicated darker stripes. Halteres with stem obscure yellow, knob dark brown. Legs with coxae and trochanters brownish black; femora dark brown to brownish black, bases obscure yellow, more extensive on the hind legs; tibiae dark brown, tarsi passing into black. Wings tinged with yellow, the prearcular and costal regions clear light yellow, unpatterned; remainder of wing with relatively sparse light brown spots in most cells, more numerous in outer cells and *1st A*, very sparse to virtually lacking in *M, Cu* and *R;* larger areas at origin of *Rs, r–m* and outer end of cell *1st* M_2; smaller spots transverse, with about three to five in each of the outer radial cells and *1st A*, fewer in *Cu* and outer medial cells, cell *2nd A* unpatterned; the Churong paratype has the dark areas somewhat more numerous, especially in the outer medial field; veins light brown, in the brightened fields more yellowed. Macrotrichia of veins short to very short, lacking on basal half or more of *M* and bases of *Sc, Rs, Cu* and *1st A*, lacking on *2nd A*. Venation: R_{2+3+4} shorter than R_{2+3}, more rarely subequal; in one paratype with R_{2+3+4} very short, less than the basal section of R_5; cell *1st* M_2 relatively short, cell M_1 subequal to or longer than its petiole, *m-cu* before fork of M_{3+4}; cell *2nd A* relatively narrow.

---

[1] Contribution from the Entomological Laboratory, University of Massachusetts.

Abdomen, including genitalia, brownish black. Ovipositor with cerci elongate, the outer half or more narrowed, tip narrowly obtuse, with an elongate seta. Male hypopygium with dististyle simple, vestiture relatively sparse. Basistyle with ventromesal lobe contiguous or confluent at midline with the opposite side. Gonapophyses long and slender, bases relatively narrow.

Habitat: North India (Sikkim).

Holotype: ♂, Gopetang, in *Rhododendron* association, 12,200 feet, 10 Oct. 1959 (Fernand Schmid). Allotype: ♀, Tangshing, in *Rhododendron* association, 14,100 feet, 6 Oct. 1959. Paratypes: 2 ♂♂, with the allotype; 1 ♀, Churong, in *Rhododendron* association, 12,400 feet, 8 Oct. 1959 (Fernand Schmid).

Trichocera bellula is readily told from other regional species having patterned wings by the coloration of the legs and abdomen and especially by the coloration and pattern of the wings. The most similar such species include *T. punctipennis* Brunetti and *T. superna,* n.sp.

Trichocera percincta, n.sp.

General coloration of thorax brownish black; basal segments of antennae yellowed, first flagellar segment short and stout; head buffy brown, vertical tubercle darkened; knobs of halteres blackened; legs obscure yellow; wings strongly yellowed, with narrow but conspicuous brown seams at origin of *Rs*, cord and outer end of cell *1st* M_2; R_{2+3} short, subequal to R_2; cell M_1 deep, its petiole subequal to or shorter than *m;* abdomen dark brown, segments two to five with posterior borders broadly obscure yellow; ovipositor with cerci light horn colored.

Male: Length about 6.5–6.7 mm.; wing 7–7.4 mm.; antenna 3.3–3.8 mm.

Female: Length about 7–8 mm.; wing 7–9 mm.; antenna 3.8–4 mm.

Rostrum black, mouthparts horn colored, palpi black. Antennae approximately one-half the length of wing; scape brownish yellow, pedicel clearer yellow, flagellum brownish black, outer segments paler; first flagellar segment relatively short and stout, slightly longer than the slender second and third. Head buffy brown, vertical tubercle darkened.

Pronotal scutum dark brown in front, its posterior border and the scutellum paler brown. Mesonotal praescutum and scutal lobes chiefly brownish black, posterior border of scutum, most of scutellum and anterior part of mediotergite light brown, remainder of pleurotergite dark brown; central part of mediotergite broadly depressed, probably an abnormal condition. Pleura chiefly brownish black, paler beneath the wing root. Halteres with stem pale, knob blackened. Legs with coxae brownish yellow, outer tarsal segments darker. Wings with the ground strongly yellowed, particularly the prearcular and costal fields; a dark brown pattern that is restricted to narrow seams over certain of the veins, including the origin of Rs, Sc_2, R_2 and adjoining veins, cord and outer end of cell *1st* M_2; more restricted darkenings in outer end of cell R_2, fork of M_{1+2} and at tip of vein *2nd A;* veins brownish yellow, darker in the patterned areas, Cu_2 light yellow. Macrotrichia of veins relatively short, lacking on bases of *Sc, M* and *1st A; 2nd A* with from four to ten trichia at near midlength; no trichia on *r-m;* about five small punctures on *Sc* near *h,* the outer two larger. Venation: Sc_1 ending opposite R_2, Sc_2 about opposite one-third *Rs;* R_{2+3} short, slightly elevated, subequal to R_2 and only about one-third R_{2+3+4}; cell M_1 of type deep, its petiole subequal to or shorter than *m,* in a paratype cell M_1 is about one-half longer than its petiole; *m-cu* about one-half its length before fork M_{3+4}; cell *2nd A* relatively narrow.

Abdomen dark brown, posterior borders of segments two to five broadly and conspicuously obscure yellow, the color less evident on the sixth segment. Ovipositor with cerci light horn color, relatively slender, outer half narrowed and decurved. Male hypopygium with a very small basal tubercle on dististyle. Gonapophysis long and slender.

Habitat: North India (Sikkim).

Holotype: ♀, Yangsap, in *Rhododendron* association, 13,120 feet, 9 Oct. 1959 (Fernand Schmid). *Allotype:* ♂, Dzongri, in *Rhododendron* association, 13,222 feet, 14 Apr. 1959. *Paratypes:* 1 ♀, Gey, in *Rhododendron* association, 11,650 feet, 18 May 1959; 1 ♀, Sidwani, 1150 feet, 1 May 1959 (Schmid).

Trichocera percincta is most similar to the Holarctic *T. maculipennis* Meigen, differing especially in the coloration and venation of the wings.

Trichocera superna, n.sp.

Size large (wing of male about 10 mm.); general coloration of thorax plumbeous, the praescutum with an intermediate pair of darker stripes; legs brownish black to black; wings whitened, with a conspicuous brown and gray pattern, the latter chiefly in the outer radial and medial fields; basad of cord with major brown areas at origin of *Rs* and tip of vein *2nd A*.

Male: Length about 6–6.5 mm.; wing 9–10 mm.; antenna about 3.2–3.5 mm.

Female: Length about 7.5 mm.; wing 11 mm.; antenna about 3.8 mm.

Rostrum dark brown, palpi black. Antennae relatively short, black, paler outwardly; first flagellar segment about one-third longer than the second or third; verticils and vestiture short. Head brown, vertical tubercle darker; sides of posterior vertex with long erect black setae.

Pronotum and mesonotum black, sparsely pruinose to appear plumbeous, praescutum with two slightly darker and more shiny intermediate stripes, the lateral pair less evident, setae of praescutum and scutum long and conspicuous. Pleura plumbeous. Halteres with stem light brown, knob blackened. Legs with coxae blackened plumbeous; remainder of legs uniformly brownish black to almost black. Wings whitened, prearcular and costal fields slightly more yellowed; a large subquadrate brown spot at origin of *Rs,* with a smaller similar area over *r-m;* paler brownish gray areas at R_2 and as a series of more or less confluent spots and clouds in the outer radial cells, normally including three or more in cells R_4 and R_5, more reduced in some specimens; similar washes at forks of R_{2+3+4} and M_{1+2}, outer end of cell *1st* M_2 and in *Cu,* with still fewer clouds in outer medial cells; a cloud at tip of vein *2nd A* but without spots elsewhere in the Anal field; in the holotype with vague washes in base of cell *R,* center of *M* and near outer end of *1st A;* veins brown, *Sc, R* and *Cu* slightly more yellowed. Macrotrichia of veins unusually small but numerous, lacking on *2nd A* and extensively on bases of *Sc, M* and *1st A,* in the holotype and one paratype lacking on *M.* Venation: R_{2+3+4} and R_{2+3} subequal or the former a little longer; cell M_1 slightly longer than its petiole; *m-cu* before fork of M_{3+4}, in cases to one-third its length; cell *2nd A* broad.

Abdomen dark brown, posterior borders of segments slightly darker, outer segments and hypopygium more uniformly blackened. Ovipositor with cerci yellow, very broad and leaflike, only a little longer than wide, tips broadly obtuse. Male hypopygium with the dististyle simple, without basal tubercle; a concentration of longer setae on outer half; ventromesal lobes of basistyles broadly contiguous at midline. Gonapophysis moderately long and slender, narrowed to the acute tip.

Habitat: North India (Sikkim).

Holotype: ♂, Tangshing, in *Rhododendron* association, 14,100 feet, 6 Oct. 1959 (Fernand Schmid). *Allotopotype:* ♀. *Paratypes:* 4 ♂♂.

Trichocera superna superficially is most similar to *T. punctipennis* Brunetti (a synonym of *T. versicolor* Loew, according to Edwards), differing evidently in the coloration of the legs and wings. Although the male hypopygium does not show particularly distinctive features the structure of the ovipositor is noteworthy.

Trichocera variata, n.sp.

General coloration of mesonotum brownish gray, the praescutum with four darker brown stripes, mesonotal scutellum partly or entirely yellow; knobs of halteres brownish black; femora brown, tips vaguely paler, tibiae and tarsi brownish black to black; wings weakly tinged with brown, in cases slightly patterned with darker; numerous macrotrichia on vein *Sc; 2nd A* with about two trichia at near midlength; male hypopygium with the dististyle simple, gonapophysis long and bladelike.

Male: Length about 5.5–6 mm.; wing 5.5–7 mm.; antenna about 3.5–4 mm.

Rostrum dark brown; palpi black, elongate. Antennae with scape and pedicel brownish yellow, proximal flagellar segments brownish black, the outer ones pale; basal flagellar segment a little shorter than the combined second and third. Head brown.

Pronotum brown, scutellum yellowed. Mesonotal praescutum brownish gray, with four darker brown stripes, the intermediate pair confluent in front; scutal lobes dark brown, the broad median area light brown; scutellum of type darkened basally, apex broadly yellow, in the paratypes, scutellum entirely yellow; postnotum brownish yellow. Pleura chiefly dark brown. Halteres with stem whitened, knob brownish black. Legs with coxae and trochanters brownish yellow; femora light brown to brown, tips vaguely and narrowly paler; tibiae and tarsi brownish black to black. Wings weakly tinged with brown, stigma and a very narrow seam over *r-m* darker brown; vein *Cu* broadly seamed with somewhat paler brown; veins brown. In some paratypes, the darkened pattern other than the stigma is lacking. Macrotrichia of veins relatively abundant, *Sc* with several tiny punctures on either side of *h,* the succeeding section lacking these; before midlength to origin of *Rs* with a sparse series of small setae, these becoming more numerous outwardly; *Rs* with trichia to near base; *r-m* without trichia in holotype but with several on a paratype (from Rata); vein *2nd A* with one or two trichia at near midlength. Venation: Sc_1 ending beyond fork of R_{2+3+4} but before R_2; petiole of cell M_1 from about one and one-half to nearly twice *r-m;* vein *2nd A* subangularly bent into margin beyond midlength.

Abdominal tergites dark brown, basal sternites darkened, the narrow bases brownish yellow. Male hypopygium with coxal bridge pale at midline but entire. Dististyle simple, with long pale setae on outer face, setulae of mesal face abundant, curved slightly cephalad. Gonapophysis long and bladelike.

Habitat: North India (Kumaon, Uttar Pradesh).

Holotype: ♂, Kulara, Pauri Garhwal, 12,000 feet, 3 Aug. 1958 (Fernand Schmid). *Partaypes:* ♂, Rata, Almora, 11,000 feet, 14 Sept. 1958; 2 ♂♂, Trijugi, Pauri Garhwal, 7000 feet, 26 May 1958; ♂, Gangrea, Pauri Garhwal, 7500–10,000 feet, 12 June 1958; ♂, Tapoban, Pauri Garhwal, 7300 feet, 2 Aug. 1958 (Fernand Schmid).

The present fly is closely related to *Trichocera regelationis* (Linnaeus), differing in slight details of coloration and wing trichiation. In *regelationis,* vein *2nd A* has numerous macrotrichia, including some basad of the internal crossvein.

BLEPHAROCERIDAE

Edwardsina imperatrix, n.sp.

Size very large (wing of female 16 mm.); general coloration of thorax reddish brown, praescutum striped with gray; maxillary palpi 4-segmented, first segment long and slender, near equal to the combined remaining segments; femora yellow, tips narrowly brownish black; wings subhyaline, stigmal region elongate, yellow; spur of *Rs* very long; vein M_2 preserved as a basal spur.

Female: Length about 11 mm.; wing 16 mm.

Rostrum elongate, subequal to the vertical diameter of the head; maxillary palpi 4-segmented, first segment long and slender, nearly as long as the remaining segments combined; third segment about one-half the second; terminal segment elongate, about one-half longer than the third; labial palpi short, ending far before apex of labrum. Antennae black; terminal segment subequal in length to the penultimate, pointed at tip. Head with vertex reddish brown, clypeus pale, white pruinose, orbits and genae broadly whitish gray; ocelli widely separated, especially the posterior pair.

Pronotum light gray, paler laterally. Mesothorax with the ground reddish brown, very heavily pruinose, on praescutum forming gray stripes that are more whitened posteriorly. Halteres with stem yellow, knob large, brownish black. Legs with coxae reddish, pruinose; trochanters yellow; femora yellow, tips narrowly but conspicuously brownish black, the amount subequal on all legs; tibiae and tarsi more uniformly yellow, terminal tarsal segment black. Wings subhyaline; stigmal region yellow, elongate; veins black, paler at wing base and in stigmal area. Venation: Spur of *Rs* very long, about three-fifths the length of cell *R;* vein M_2 preserved as a spur, nearly as long as either *Rs* or *r-m.*

Abdominal tergites broadly cinnamon brown on sides, light silvery gray medially, this color becoming more extensive on the outer segments; sternites more extensively whitened; ovipositor light fulvous.

Habitat: Argentina (Neuquén).

Holotype: ♀, Lago Lacar, 650 meters, 15 Oct. 1953 (Serge Schachovskoy).

Edwardsina imperatrix is the largest known species of the genus, being approached in size by the entirely distinct *E. argentinensis* Alexander. The presence of vein M_2 as a short spur is of particular interest.

A dripless dispensing bottle. For several years I have been using a screw-top glass bottle with a neck and lip cleverly designed so as to "suck" that last drop back into the bottle. The easily obtainable 12 ounce Vermont Maid maple syrup bottle is of this type. After its original contents have been enjoyed and the label soaked off, this bottle is quite satisfactory for handling other liquids. With liquids of high viscosity or high surface tension, such as water and formaldehyde, it is virtually drip-proof. That troublesome last drop which runs down the outside of ordinary containers or may fall onto your notes in the laboratory cannot be enticed over the lip of this special bottle. And on field trips, when concentrated formaldehyde must be repeatedly poured from the stock bottle, one's car no longer need smell offensively from the fumes of escaped droplets.—John F. Hanson, Amherst, Mass.

A JAMAICAN *NEOEMPHERIA* OSTEN-SACKEN, 1878, (DIPTERA:MYCETOPHILIDAE)[1]

By Edward I. Coher, Amherst, Mass.

The fungus gnat fauna of the West Indies is practically unknown and thus it was with great interest and anticipation that I made a trip to Jamaica to collect specimens with Dr. Thomas H. Farr of the Institute of Jamaica. In certain areas of the island the collecting proved to be very rich, and among the specimens taken was the pair of *Neoempheria* described below. My approach to the resting place of these insects in the damp, shady jungle disturbed them. When recovered from the net they were not coupled. However, I was under the impression that they were *in copula* as they flew off. Therefore, despite certain small differences, I am assigning the female to the same species as the male.

Examination of the two specimens shows that they have the characteristics of the Maculipennis Group (Coher, 1959:17), the wings of the female being typical, those of the male being somewhat darkened apically. This group of species, to which *N. jamaicensis* n. sp. belongs, is characterized as follows.

Maculipennis Group

Head: the two ocellar bristles long, reaching forward nearly to base of antennae; antenna with first flagellar segment barely shorter than scape plus pedicel; apical dorsal seta of pedicel longer than first flagellar segment. *Pleura:* with dark oblique stripe from wing base to base of forecoxa; postnotum with dorsal transverse stripe which extends onto and suffuses base of pleurotergite and basal posterior margin of mesoepimeron. *Wing:* Sc_2 ending slightly beyond base of Rs; Sc apically setiferous; cell R_3 about three times as long as wide, subequal in length to M_{1+2}; M_1, M_4, Cu and Cu_1 setose, M_2 bare; posterior fork basad of fR; a narrow dark band from below R_{4+5} through fM_{1+2}; basal cell with dark spot at base; costal cell suffused; apex of wing suffused but with lighter area apically in cells R_5 and M_1. *Male terminalia:* eighth tergite subtrapezoidal, with median posterior margin convex and setose; anterior margin broadly emarginate; eighth sternite sub-

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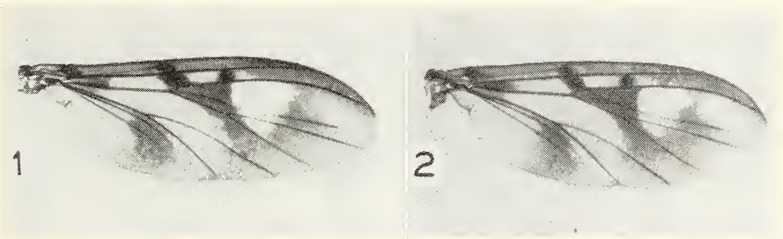
[1] Contribution No. 1345 from the entomological laboratory of the University of Massachusetts. Published with the aid of a grant from the Guy Chester Crampton Research Fund of the University of Massachusetts.

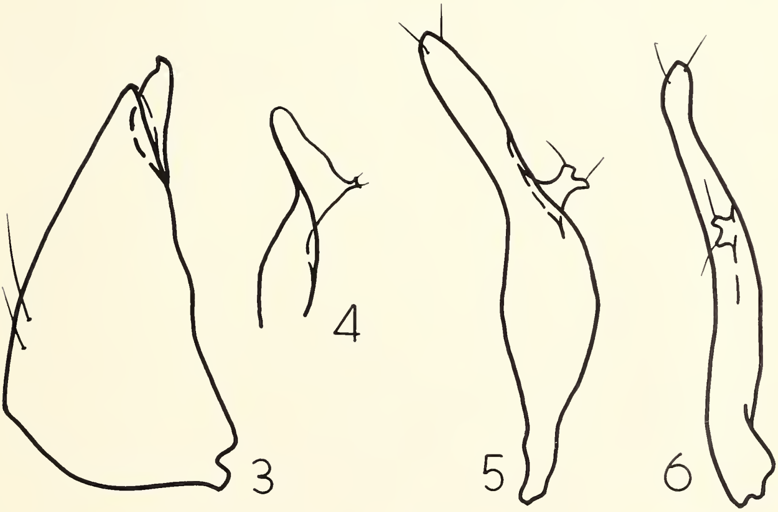
triangular with posterior margin truncate and setose; anterior margin widely and shallowly emarginate; outer style compressed, subtriangular, with 'porose' area on median lateral surface at sternal angle; subaedeagal rod U-shaped; tergal portion with a patch of setulae basally; anal segment short.

Neoempheria jamaicensis, n.sp.

Male.—*Head:* vertex, occiput and postfrons brownish; prefrons,



Neoempheria jamaicensis, n.sp. Fig. 1, Wing of male. Fig. 2, Wing of female.



Neoempheria jamaicensis, n.sp. Fig. 3, Tergal portion of terminalia (setae omitted). Fig. 4, Sketch of unmounted apex of inner style. Fig. 5, Inner style, right, rotated about 45° dorsally. Fig. 6, Inner style, left, rotated about 90° dorsally. Figures not to scale.

postclypeus and anteclypeus yellowish-brown; anteclypeus with setae laterally; antenna with scape and pedicel yellowish, flagellum brownish; palpus brownish. *Thorax:* anterior and posterior pronotum, postspiracular plate and paratergite yellow; mesonotum with dorsocentral, acrostichal and sublateral dark stripes strongly developed; acrostichal stripes coalescing posteriorly and also coalescing with sublateral stripes anteriorly; dorsocentral stripes not quite coalescing with acrostichal stripes posteriorly; setae in above mesonotal positions in well-differentiated rows; scutellum with short, fine setae dorsad, laterad and mesad of scutellar setae; wing with apical light areas in cells R_5 and M_1 poorly delimited; Sc with a single apical seta; wing 3.5 mm. (Figs. 1, 2). *Abdomen:* TI dark posterodorsal saddle; TII anterodorsal dark saddle; TIII dark with light semi-oval anterolateral area; TIV small anterodorsal dark saddle; TV same as TIII but light area smaller; TVI dark dorsally and along lateral margin; TVII dark posterodorsal saddle. *Terminalia:* (Figs. 3 to 6): tergal portion with apical process dark, subtriangular; apical half of lateral margin of process narrowed to form a small apical hook; apex of tergal portion produced to form a small depression between it and apical process, with median surface setose; sternal portion with inner style somewhat compressed, broad, narrowed and twisted apically so that the apex is somewhat like an L-beam from the basal portion of which a shallowly bifid process tipped by two small setae arises; inner process short, cupped, apically truncate, setose; paramere sclerotized basally; SIX divided to base, with apex rounded, bare.

Female.—Like male but with light area of abdominal TIII somewhat smaller; apical light areas of wing in cells R_5 and M_1 much more distinct than in male; Sc with two or three setae apically.

Discussion.—*N. jamaicensis* is most closely related to *N. maculipennis* Williston, 1896, and *N. mülleri* Edwards, 1940. It differs from them in having more suffusion across wing cell R_5. The inner style of the male terminalia of the new species differs by having a twisted apex and a subapical bifid lobe.

Types.—*Holotype* male and *allotopotype* female. WEST INDIES: Jamaica, Portland Parish, 1 mile WSW of Ecclesdown, 21 Jan. 1961 (E. I. Coher). Types in my personal collection.

LITERATURE CITED

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NEW SPECIES OF HYDROPTILIDAE (TRICHOPTERA)

By R. L. Blickle, Durham, New Hampshire[1]

During a survey of light trap collections from Florida several undescribed species of Trichoptera were encountered. The following four descriptions are based on the male genitalia. Two of the species are in the genus *Hydroptila,* and one each in the genera *Neotrichia* and *Ochrotrichia.* Holotypes and paratypes will be placed in the Illinois Natural History Survey Museum, Urbana, Illinois.

Appreciation is expressed to Dr. Maurice Provost, Dr. and Mrs. Robert Harrington, Miss Lucille Logan of the Florida State Board of Health and Mrs. M. Olson Blickle whose cooperation made it possible to complete the light trap survey.

Hydroptila lloganae, n. sp.

Male: Length from front of head to tip of wings 2.5 mm. The apico-mesal process of the seventh sternite short and pointed. Eighth segment with very dense, long hair concealing the genitalia. Genitalia (Fig. 1). Tenth tergite (Fig. 1D) composed of three lobes; dorsal lobe appearing broad and flat, lateral ones ear-shaped. Claspers broad at base, tapering towards apex; a row of hairs on the lateral margin; two small protuberances laterally near the apex. Aedeagus (Fig. 1B) 0.6 mm. long; basal part twice as long as apical; spiral small; apical part with a transparent, alate-like structure on one side.

In ventral view (Fig. 1C) this species resembles *H. latosa* Ross: however, the internal process of the ninth segment is shorter and the claspers do not have lateral processes on the base.

Holotype: Chattahoochee, Florida, 21 Apr. 1957. *Paratypes:* Chattahoochee, Florida, one, 15 Mar. 1957; one, 29 Mar. 1957; two, 19 Apr. 1957; one, 23 Apr. 1957; three, 3 May 1957; three, 21 May 1957; one, 13 June 1958. Goose Prairie, Florida, one, 9 May 1958. Highlands Hammock State Park, Florida, five, 22 Mar. 1958; one, 25 Apr. 1958; one, 9 May 1958; one, 13 June 1958; one, 13 Sept. 1957; one, 15 Sept. 1957; one, 25 Sept. 1957; two, 15 Oct. 1957; one, 25 Oct. 1957. Temple Terrace, Florida, one, 11 Apr. 1958; one, 29 Apr. 1958; one, 13 June 1958; one, 27 Dec. 1957.

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[1] Published with the approval of the Director of the New Hampshire Agricultural Experiment Station as Scientific Contribution No. 273.

Hydroptila molsonae, n. sp.

Male: Length from front of head to tip of wings 3 mm. The apico-mesal process of the seventh sternite short and pointed. The apico-lateral margin of the eighth tergite with two long spines on one specimen, three in the other; eighth sternite and tergite deeply incised; ventral and apical part of segment densely clothed with long hairs. Genitalia (Fig. 2): in lateral aspect (Fig. 2A) claspers broad and heavy, tapering to the apex which is bent down sharply; internal part of claspers large and projecting dorsally; claspers in ventral aspect (Fig. 2C) broad, parallel sided. Tenth tergite small, upcurved at apex; lateral to the tenth tergite two long upcurved arms, one on either side; these arms appearing sinuate in ventral view. Aedeagus with a sharp bend at apex; basal part slender for one-third its length then gradually widening.

This is a striking and easily recognized species due to the long spines on the eighth tergite. *H. lonchera* Blickle and Morse also has similar spines on the apico-lateral margin of the eighth tergite. The long upcurved arms (Fig. 2A), corresponding to the parameres of A. Nielsen, are also distinctive.

Holotype: Highlands Hammock State Park, Highlands Co., Florida, 25 Sept. 1958. *Paratype:* same date as holotype.

Neotrichia elerobi, n. sp.

Male: Length from front of head to tip of wings 2 mm. Eighth segment with a heavy brush of spines apically. Genitalia (Fig. 3). Tenth tergite membraneous, dorso-apical part projecting in lateral view. Two long pointed lobes below the tenth tergite; these lobes, when the specimen was placed in cellulose mounting media for observation, drew together below the aedeagus until their mesal margins touched; in alcohol the lobes spread apart (Fig. 3C). Claspers small and hooklike, appearing smooth in ventral view and toothed in lateral view. Aedeagus with long spiral process and an irregular, expanded membranous area around the apex.

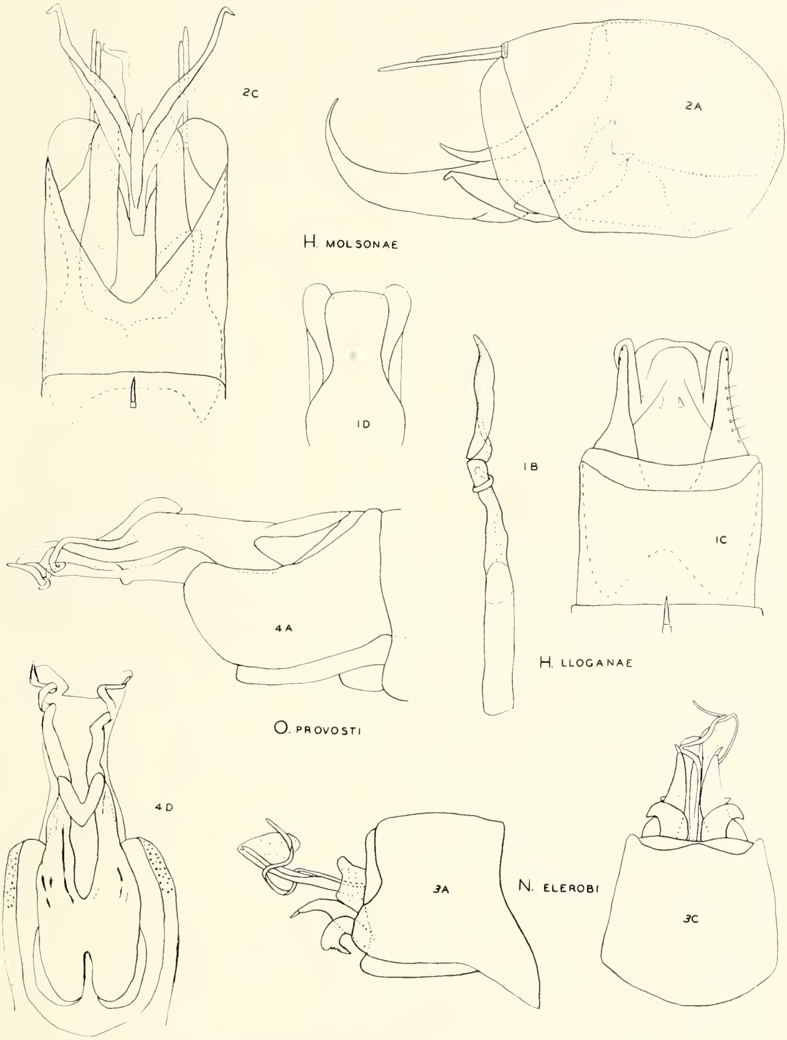
This species is closely related to *N. vibrans* Ross: however, it differs in the shape of the aedeagus and in the long pointed lobes beneath the tenth tergite.

Holotype: Laurel Hill, Florida, 30 Apr. 1957.

Ochrotrichia provosti, n. sp.

Male: Length from front of head to wing tip 3 mm. Tenth tergite (Fig. 4D) with two long sclerotized processes, one on each

BLICKLE


2C
2A
H. MOLSONAE
1D
1B
1C
H. LLOGANAE
4A
O. PROVOSTI
4D
3A
N. ELEROBI
3C

Male genitalia of *Hydroptila, Neotrichia, Ochrotrichia:* A, lateral view; B, aedeagus; C, ventral view; D, dorsal view.

side, of approximately equal length; these processes convoluted at apex; convolutions rotating in the same direction but differing in the number of turns; basally the sclerotized processes unite into two ovoid-like masses; in lateral view base of processes divided into upper and lower sclerotized parts; apex of convolutions connected by a sclerotized structure which extends basally to the ninth segment; this structure appearing as a thin sheet in dorsal view.

This species differs from others in the genus in that it possesses two sclerotized rods or processes on the tenth tergite.

Holotype: Temple Terrace, Florida, 12 July 1957.

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THE NEW CODE

A LETTER FROM PROFESSOR BRADLEY

Dear Dr. Hanson:

It will interest your readers to know that the long-awaited newly revised International Code of Zoological Nomenclature is scheduled for publication the first week of November, 1961, and may be obtained, post free, for one pound sterling upon application to the Publication Office, The International Trust for Zoological Nomenclature, 19 Belgrave Square, London, S.W. 1.

This new revision was commenced at the Paris Congress in 1948, and has since then had incorporated in it the principles laid down in the Opinions of the International Commission on Zoological Nomenclature during the preceding half century, which had come to compromise a formidable body of case-law. It was the subject of close scrutiny by the First International Colloquium on Zoological Nomenclature in Copenhagen, which sat continuously from the 29th of July to the 4th of August, 1953, and was attended by 51 zoologists from some twelve countries. Based on the old code and all the revisionary decisions reached up to that period a new tentative draft code was then prepared and published, as was also an extended bulk of subsequent comment emanating from world-wide sources. All this material came before the Second International Colloquium on Zoological Nomenclature which was held at London in July, 1958, with a membership of approximately 200 zoologists. The ensuing Fifteenth International Congress of Zoology empowered its Commission on Nomenclature to adopt and publish the final wording of a fully revised code, based entirely on the decisions reached by the Colloquium and Congress, except that it was given power to decide a few details which time had prevented from being considered at London. The final wording and editing of the new code was placed in the hands of a committee of two French, two British and two American zoologists. Their work, the results of which have been adopted by the Commission, has proven most arduous, and has taken many months and even years to accomplish. It included a week's session in London in the spring of 1959.

The Code, in its new guise, forms a volume of almost exactly 200 pages and consists of equivalent English and French texts on facing pages, English and French glossaries, Index, Introduction by Norman R. Stoll, and a Preface.

Yours truly,
J. Chester Bradley
President of the International
Commission on Zoological
Nomenclature

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This 36 page **Supplement** now is included with each copy of the **Glossary** at the new price of $6.00—it may be secured as a separate publication for $1.00 through our Treasurer, Mr. R. R. McElvare, P. O. Box 386, Southern Pines, North Carolina.

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